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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

February Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, February 8, 1895.

The February meeting of the Society of Gas Lighting will be held in The Arena, No. 39 East 31st street, at 3 P.M., Thursday, the 21st inst.

FRED. S. BENSON, Secretary.

[OFFICIAL NOTICE.]

Second Annual Meeting, Michigan Gas Association.

OFFICE OF THE SECRETARY, SAGINAW, MICH., Jan. 23, 1895.

To the Members of the Michigan Gas Association—Gentlemen: The second annual meeting of the Michigan Gas Association will be held in Saginaw, on February 20th, 1895, and will be called to order at 9 o'clock, A.M., sharp. As the meeting is of but one day's duration, it is absolutely essential to begin business early. Please bear this in mind.

The headquarters of the Association will be at the Hotel Vincent, a new and beautifully furnished steam-heated house. Although the house is usually lighted by electricity, arrangements have been made by which our members will not be compelled to use it. The usual rates charged are $2, $2.50 and $3 per day, but it is arranged that a uniform rate of $2.50 will be charged, with a preference to the better rooms.

The meeting of the Association will be held in the parlors of the hotel, and we are promised the best that the house affords. Members and those wishing to meet with us will please write the Secretary engaging rooms ahead of time, for we are to have a very large meeting this year, and it is advisable to house all at the same place.

The following papers will be presented for consideration:

"The Heating Effect of Artificial Lights," by Mr. Henry W. Douglas.

"Federation," by Mr. C. H. Raynor.

"Opposition Gas Companies," by Mr. Joseph Walker.

"Whose Make of Lighting Fixtures Shall We Recommend?" by Mr. W. M. Eaton.

Although the Michigan is yet small in numbers and Saginaw seemingly away out in the woods, it is but three hours' ride from Detroit, and easily reached from all directions. We will therefore expect not only every member, but a great many more who will become members, to meet with us at this time. Very respectfully yours,

HENRY H. HYDE, Secretary.

[OFFICIAL NOTICE.]

Eleventh Annual Meeting, Ohio Gas Light Association.

OFFICE OF THE SECRETARY, COLUMBUS, O., February 1, 1895.

To the Members of the Ohio Gas Light Association: The eleventh annual meeting of this Association will be held in the parlors of the Arcade Hotel, Springfield, O., March 20th and 21st, 1895; and it is hoped that every member will be present and take an active part in the meeting.

A list of papers to be read will be announced later.

A. P. LATHROP, Secretary.

[Special Editorial Correspondence.]

THE NEW ENGLAND'S SILVER WEDDING.

PARKER HOUSE, BOSTON, MASS., Thursday Morning, Feb. 14, 1895.

Dear JOURNAL: Thinking it best to wait until refreshing sleep had calmed the quickened circulation caused by an active participation in the Silver Wedding banquet of the Mother Association, I forward a summary of the first day's proceedings under the hour, day and date which head this despatch. As was expected, the members turned out in good number to wish the New England Association joy over the attainment of her Silver Wedding anniversary; and, although the visiting delegation was perhaps not as numerous as in other years, nevertheless, many tried and true ones responded to the invitation to be on hand. Notable among the visitors were Mr. J. B. Crockett, of San Francisco; B. E. Chollar, of St. Louis; Dr. Wilkinson, C. H. Corbett and C. W. Isbell, of New York; Commissioner Barker, of Boston; Col. Benson, of Brooklyn—who, it is said, will be the ranking engineer in the re-arrangement of Brooklyn's many gas works; Mr. Gribbel, of Philadelphia; D. D. Flemming, of Jersey City; Mr. Bush, of New York, and others. The general attendance was excellent, as will be seen by a perusal of the roll call, which, I presume will, with some other installment of the proceedings of the first day, appear in your current issue. Although the meeting had to be brought forward one week from the time named in the articles of the Association, because of the inability of the Committee of Arrangements to secure hotel accommodations and meeting room for the third Wednesday in February, no inconvenience was occasioned; and it can be said that the Parker House was in every sense an excellent substitute for Young's—the only difference being that perhaps the "home feeling" was lacking in respect of the former.

The weather was superb, and it was hard to realize that all but a week ago New England was fast locked in snow, made less endurable by zero on the thermometer markings. However, President Nettleton and Secretary Prichard wore an air of content when the Association was called to order, for the delegates were many. One chair, though, was vacant—that which from the beginning had been occupied by the late Mr. Samuel G. Stiness, whose memory was so feelingly alluded to by President Nettleton in his annual address. The President's address was well received, and while he had nothing out of the ordinary to report upon, nevertheless a hopeful vein ran through it. His expressed belief that the state of trade in general was fast assuming the normal was amply confirmed by the sentiments of about all those present, not a few of whom declared that their experience was that the year so far in results was quite up to its predecessor of 1893. Mr. Nettleton's paper was, of course, in his usual thoughtful and level-headed vein, and will well repay a careful perusal. The membership roll was increased by the addition of two honorary and eight active; and the Association honored itself when it bestowed its greatest honors on Mr. T. F. Rowland, of New York city, and on Mr. A. C. Wood, of Syracuse, N. Y. The paper list was increased by the reading of one number additional to those listed in the advance circular. The title of the paper was "A Cubic Foot of Gas," and its author was Mr. C. D. Lamson. It gave rise to a short and sharp discussion; but we regret to say that Mr. Lamson read the paper with the stipulation that it should not appear in the proceedings. It was bright and entertaining and instructive, and I sincerely hope that he can be prevailed upon to reconsider his determination not to have it printed. The Lamson paper was followed by a decidedly entertaining series of reminiscences by Col. J. H. Armington, whose subject was the formation of the New England Association. His recital was the prelude to the reception of the resolutions from the Committee respecting the memory of Mr. Stiness, which certainly have the true ring of respect, love and sorrow in them. The business following the first adjournment—the opening of the afternoon session—was to the question, "What is the Best Course to Pursue When a Person is Overcome by Gas Inhalation?" and Dr. Amory's contribution to the discussion (he spoke from the standpoint of a practical physician), was well worth hearing. Then came the paper by Mr. Nute, of Fall River, Mass., who considered the effect of the introduction of the Welsbach lamp on the business of the Gas Company, which provoked a rattling good discussion. The sum of the speeches was that the Welsbach lamp was a good enough thing to be "pushed along." The Association then elected officers for the ensuing year, the gentlemen chosen being: President, C. D. Lamson; First Vice, S. J. Fowler; Second Vice, W. R. Addicks; Secretary and Treasurer, C. F. Prichard; Directors, J. A. Coffin, F. S. Richardson, C. D. Sherman, W. A. Learned and N. W. Gifford. The officers-elect having suitably acknowledged their preferment, an adjournment was ordered, so that the banquet could be made ready. At the appointed hour the "festive board"—or "boards"—was surrounded by as representative a set of New England's gas men as could possibly be named, and with President Nettleton for toastmaster everything went off as smoothly and fraternally as the New England's feasts always do. Many of the members are accompanied by their wives, and the arrangements for their comfort are nothing short of perfect, the glorious weather splendidly aiding the Committee to carry out its programme.—C.

PARKER'S, 2:30 P.M., Thursday, Feb. 14.

Dear JOURNAL: The last day's session was completed about an hour ago, and it was a fitting sequel to the record of yesterday. No fewer than 86 members took part in the proceedings, which were opened by the reading of the "Notes" prepared by Mr. W. A. Wood, who as usual was concise and accurate in his presentation of the facts commented upon. The report of the Committee on Electrolysis (read by Mr. W. R. Addicks) was then taken up, and it may not be gainsaid that the Committee did its work well. Mr. Fowler's description of some "card catalogues," etc., then occupied the attention of the convention, and the gentleman from Springfield described some methods that are likely to find favor in other works equal to that which they have gained with him. Carbide of calcium now came in for debate, Prof. Wilkinson and Mr. Hinman speaking somewhat freely on the "curiosity." On the whole, the discussion strongly tended to put the enriching material in the list of those marked "too expensive." The question box developed good fruit for discussion, after which the customary votes of thanks brought to a close one of the most enjoyable meetings of the many for which the New England is responsible. And so the silver honored matron goes placidly and thoughtfully along the highway that leads to fuller years of usefulness and teaching accomplished.—C.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.]

TWENTY-FIFTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT THE PARKER HOUSE, BOSTON, MASS., FEB. 13 AND 14, 1895.

FIRST DAY—MORNING SESSION.

The Association was called to order by the President, Charles H. Nettleton, at 10:30 A.M., Wednesday, Feb. 13.

The President—Before proceeding with the business of the Association the Secretary has something he would like to explain.

The Secretary—According to the Constitution this meeting should have been called for a week later. In attempting to make the arrangement, as we usually do in the Fall, along in November we called at Young's Hotel, where we have usually held our meetings, but found that for the days for which we wished to reserve the hall it had already been engaged, and had also been engaged for the week previous and for the week following; so that it became impossible for us to go there at all. We then came here, and found that the rooms had been engaged for the week set down in the Constitution for our meetings, but not for the week previous. We also looked at other hotels. We held this room until the Directors' meeting in December, and at that time the Directors deemed it best to have the meeting here rather than go to any other hotel. That is the reason why we are here to-day.

Mr. Slater, Sr.—In view of the explanation of the Secretary, I offer the following resolution:

Resolved, That Article 2 of the Articles of Agreement be suspended, and that the action of the Directors in changing the date of this meeting be ratified.

Mr. Wood seconded the motion, which was carried.

ROLL CALL.

The calling of the Roll showed the following members in attendance:

Honorary Members.

Benson, Col. Fred. S., Brooklyn, N. Y.
Armington, Col. J. H., Riverside, R. I.

Active Members.

Addicks, W. R., Boston, Mass.
Africa, W. G., Manchester, N. H.
Allyn, H. A., E. Cambridge, Mass.
Amory, Dr. R., Boston, Mass.
Anderson, W., East Boston, Mass.
Atwood, H. A., Plymouth, Mass.
Bigelow, H. N., Clinton, Mass.
Blood, F. C., Ware, Mass.
Boardman, H., Bangor, Me.
Coffin, J. A., Gloucester, Mass.
Coffin, I. C., Providence, R. I.
Coggeshall, H. F., Fitchburg, Mass.
Cooper, A. F., Exeter, N. H.
Coyle, P., Charlestown, Mass.
Crafts, D. W., Northampton, Mass.
Davis, A. E., Ware, Mass.
Davis, F. R., Athol, Mass.
Dye, N. C., Rutland, Vt.
Fairbanks, F. P., Holyoke, Mass.
Fowler, S. J., Springfield, Mass.
Gifford, N. W., New Bedford, Mass.
Gillmor, O., Norwich, Conn.
Hallett, J. L., New York City.
Hassett, E. J., Beverly, Mass.
Hayden, W. H., Bath, Me.
Hintze, T. H., Chelsea, Mass.
Horton, A. J., Brattleboro, Vt.
Jenks, Z. M., Woonsocket, R. I.
Jennings, F. W., South Framingham, Mass.
Kelley, H. H., Waltham, Mass.
Lamson, C. D., Worcester, Mass.
Lane, F. H., Wallingford, Conn.
Lane, H. M., Leominster, Mass.
Leach, H. B., Taunton, Mass.
Learned, E. C., New Britain, Conn.
Macmun, G. F., Marlboro, Mass.
Manchester, G. L., Easthampton, Mass.
McKay, W. E., Boston, Mass.
Neal, G. B., Charlestown, Mass.
Nettleton, C. H., Birmingh'm, Conn.
Norton, F. W., Nashua, N. H.
Norton, H. A., Boston, Mass.
Nute, J. E., Fall River, Mass.
Page, F. D., Fitchburg, Mass.
Parker, F. H., Burlington, Vt.
Prichard, C. F., Lynn, Mass.
Purinton, A. J., Stamford, Conn.
Quinn, A. K., Newport, R. I.
Richardson, F. S., North Adams, Mass.
Rossman, G. M., Keene, N. H.
Saville, L. A., Lexington, Mass.
Sherman, F. C., New Haven, Conn.
Sherman, C. D., New Haven, Conn.
Slater, A. B., Providence, R. I.
Slater, A. B., Jr., Providence, R. I.
Spaulding, C. F., Waltham, Mass.
Spaulding, C. S., Wakefield, Mass.
Spaulding, W. H., Clinton, Mass.
Spear, J. Q. A., Dorchester, Mass.
Stratton, W. K., Haverhill, Mass.
Taber, R. B., Boston, Mass.
Tarbell, A. W., Waltham, Mass.
Thayer, W. F., Westfield, Mass.
Tilton, D. D., Newburyport, Mass.
Todd, J. R., Dedham, Mass.
Wetherbee, G. E., Worcester, Mass.
Wood, W. A., Boston, Mass.
Woodruff, C. D., Allston, Mass.

Associate Members.

Allen, W. S., Boston, Mass.
Brown, A. P., Boston, Mass.
Brown, F. H., Waltham, Mass.
Coburn, C. M., Chelsea, Mass.
Cortis, D. T., Boston, Mass.
Dart, Edward M., Providence, R. I.
Davis, F. J., Waltham, Mass.
Hicks, Geo. C., So. Boston, Mass.
Hinman, C. W., Boston, Mass.
Holmes, R. E., Winsted, Conn.
Mace, F. W., Lynn, Mass.
Sprague, Phineas W., Boston, Mass.
Thomas, F. W., Boston, Mass.
Tufts, J. P., Boston, Mass.
Waldo, C. S., Boston, Mass.
Waldo, J. A., Boston, Mass.

Mr. Taber moved that a committee be appointed to invite in any strangers who may be present with us. The motion was carried, and Mr. Taber and Mr. Coffin were appointed such committee.

Mr. Slater, Sr.—By the calling of the Roll we are reminded of the absence of a gentleman who has been connected with this Gas Association for many years, who has almost always been present at our meetings, who has always manifested an interest in our affairs, and who has very often expressed the very great pleasure and satisfaction it has been to him to come here and meet with the New England boys. He has always been staunch and true to the Association. I move that the Secretary be requested to communicate with him and express our kindly feelings towards him and our regrets that he is not present here to-day. I refer to Col. Joseph R. Thomas, an honorary member of this Association.

Mr. Anderson—I second the motion.

The President—It gives me great pleasure to put that motion. As Mr. Slater has well said, Col. Thomas has always been with us and has always taken a great deal of interest in our meetings.

The motion was carried, and the Secretary was directed to attend to the matter during the day.

On motion of Mr. Atwood, seconded by Mr. Allyn, the reading of the minutes of the last annual meeting was dispensed with.

Election of New Members.

The Secretary—The following applications have been submitted to the Directors and approved by them, and the fees have been attached to the applications:

Active Members.

Walton Clark, Manager Concord Gas Co., Concord, N. H.

Carl H. Graf, Superintendent Lawrence Gas Co., Lawrence, Mass.

J. A. Gould, Engineer Brookline Gas Co., 153 Tremont street, Boston, Mass.

C. S. Knapp, Superintendent Marblehead Gas and Electric Co., P.O. Box 755, Marblehead, Mass.

Walter F. Norton, Assistant Superintendent Nashua Light, Heat and Power Co., Nashua, N. H.

Chas. H. Nutting, Superintendent and Treasurer Chicopee Gas Co., Chicopee, Mass.

John A. Walters, Assistant Superintendent Gas Works, Stamford Gas and Electric Co., Stamford, Conn.

Fred. H. Shelton, Engineer Lewiston Gas Light Co., Lewiston, Me.

On motion of Mr. Allyn, the Secretary was directed to cast the ballot of the Association for the election of the applicants. Mr. Fowler was appointed teller.

The Secretary—If there is no objection I cast the vote of this Association for the election of the gentlemen whose names I have read.

Mr. Fowler—I declare that by vote of the Association the gentlemen named have been elected members.

The President—You have heard the report of the teller, and I declare that the gentlemen whose names have been read have been elected to membership in the Association. If any are present in the room, they will please rise. Gentlemen, in behalf of the Association, I welcome you to our ranks.

Honorary Members.

The Secretary—At a meeting of the Directors held last evening it was voted to present the names of Austin C. Wood, Syracuse, N. Y., and T. F. Rowland, Brooklyn, N. Y., for election to honorary membership.

Mr. Lamson—I move that the names of those gentlemen be added to the list of honorary members. As I agreed in the Directors' meeting last evening, I will say a few words with regard to Mr. Rowland. In one sense Mr. Rowland is not a gas man, but in another sense he is most truly a gas man. For many years he has been prominently connected with the gas interest, and probably he has done as much, if not more, than any man living to-day towards advancing the gas business to its present high standing as a profession. He is a man of wonderful inventive genius, of great energy and patience. He has devoted his life to the advancement of this interest. To him is very largely due the present advanced stage of gas fixtures in this country, and of very many other kinds of apparatus. He was interested very largely in the early stages of water gas. Very many of the present reliable figures and data with regard to water gas manufacture are due to his investigations. He is also a very prominent man in naval construction, and in iron construction. It is with pleasure that I refer to the fact that he drew up the plan of the "Monitor," which, in the early days of the war, was so destructive of the "Merrimac." It is with great pleasure that I move that we do honor to these two gentlemen. I need only say a word about Mr. Wood. You all know him as well as I do, and probably better. He has been connected with the gas business for many years, and is known throughout the country as a man who has invented several pieces of apparatus used in many works. I move that his name be added to the list; and that Mr. Fowler be instructed to cast the ballot of the Association for the election of those two gentlemen as honorary members. (Carried.)

The President—On this occasion I am very glad to act as teller myself, and to announce that Mr. Wood and Mr. Rowland are elected as honorary members of the Association.

The President then read the following address:

PRESIDENT'S ADDRESS.

It becomes my pleasant duty to welcome you to the 25th annual meeting of our Association; and in doing so, I assure you I voice the thoughts of each and every one present when I say we are glad to be here. For 24 years this Association has met regularly at this season, and most of the members have been connected with it so long, and have come to so many of these meetings that we have ceased to regard each other as mere acquaintances or business associates; and almost every man present can count in this room a number of persons who are among the warmest friends he has. As we turn our faces towards Boston each February, I am sure most of us have the feeling that we are going to attend a large family gathering, whose members are strongly united by having common aims and interests, working on the same lines, for the same objects.

During all these years there have been, of necessity, some deaths, and many of the faces with which we were familiar 10 and 20 years ago have now gone; but the change has been so gradual, and men who were formerly considered the boys have so imperceptibly come to the front that, unless we look over one of the old lists of members, we do not realize how many have gone from us forever. It is my sad duty to report to you the death of one of our prominent members, a man who was thought much of by his associates in this organization, and who had been honored by it in being three times elected President. If he had been asked which of all the Gas Associations he belonged he thought the most of, I think he would have unhesitatingly replied, "The Old New England." It is almost needless for me to mention his name. I, of course, refer to him whom many of us loved as a brother—Samuel G. Stiness. I think many will remember his remark as he took the President's chair for the first time, and he said it with a sincerity and earnestness that impressed itself on all of those present, that "This was the proudest moment of his life." From that time he has gone on with us, always at the meetings, I believe, unless detained by sickness, and always the same agreeable gentleman that we knew so well and were so glad to meet. I have taken the liberty of appointing a committee to prepare suitable resolutions in connection with his death, and they will undoubtedly report at this meeting.

I am glad to be able to state that our business as a whole is in much better condition than a year ago. At that time, as you remember, we had experienced seven months of the panic, and many of us were feeling its effects in a very much lessened output of gas. This continued from our last meeting down into the summer months; but in August and September there was a decided improvement, and since that time there has been almost uniformly, I believe, a very decided gain. Most of our companies are at the present time sending out much more gas than a year ago, and some as much or more than two years ago, when the business of the country, and, consequently, the gas business, was very active. I think the members generally feel that the clouds of adversity have been lifted, and that the sun of prosperity is once more shining—perhaps not as brightly as we could hope—but still shining.

Our principal competitor, the electric light, has sufferered the same as ourselves; and, from a limited number of statements that I have been able to gather, I should infer that they had lost more rather than less than the gas companies. There are two reasons for this: First, the necessity of people saving money because of reduced incomes and the substitution in consequence of that necessity, either of gas consumed in the ordinary, or of oil lamps; and, second, the introduction in large numbers, of the Welsbach gas burners all over the country. Of these last I will say more later on.

The competition from oil has been quite strong this past year, and with the improved burners that are now being offered it is certain that a very good light can be obtained, and the annoyance attending the use of oil has been much reduced as compared with provious years. A year ago I reported to the Association that an arrangement, consisting of a tank of oil connected by piping to fixtures, had been developed in the southwestern part of New England, and was being introduced quite

extensively in stores. Personally I felt very much discouraged over the prospects in my own town, and it seemed as if the Company I represent would lose all of the best store trade it possessed. I am happy to say, however, that during the year the sale has been checked, and, judging from my own experience, many of the plants have been discontinued.

During the past year one matter that has attracted as much, if not more, attention than any other pertaining to our business, is the development of the incandescent gas lamp, known familiarly as the Welsbach. While it may possibly be deemed questionable to discuss in an address of this kind the product of a manufacturing company, and it may savor of advertising their business to do so, yet the position of the burner is so unique—it has become so much of a factor in gas lighting, and consequently so strongly affects the whole gas industry, that it is lifted above (so far as it relates to gas companies) the plane of the ordinary article of commerce, and I trust I may be pardoned if I devote to it more than a passing notice.

I can add but little to the stock of information which you already possess in regard to this burner. Reducing the consumption of gas one-half, and increasing the candle power as compared with the ordinary burner more than 2½ times, it becomes one of the cheapest forms of producing a given amount of light from gas, and, I can almost add, from any other source that has ever come within the knowledge of the gas manager. Per foot of gas consumed, it increases the light more than four times, and a given space can be lighted much more brilliantly than with ordinary gas burners, and produce at the same time less than one-third of the heat. This last, as we all know, is not an unmixed blessing, but in competition with the electric light it enables the gas manager to meet the electricians on very nearly their own ground as to one of their strong arguments; and when the light of an ordinary Welsbach lamp is compared with a 16 or 20-candle power electric light, the comparison cannot but be favorable to the former. The lamp possesses a quality, due, I believe, to its chemical rays, of bringing out colors and textures of goods, that does not obtain with the ordinary gas burners or incandescent electric lamps, and previous to this could only be obtained from arc lamps. So far it has proved a very strong competitor of the electric light—the strongest, I think, that has ever been brought out since electric lights were first introduced; and with some of us who own electric light plants it would be pleasanter if the competition were not quite so strong. I believe, however, that in the lighting field there is room for both gas and electricity. There is certainly a demand for both now, and that demand will undoubtedly continue to exist; local circumstances will probably determine which light will be most largely used, but that either light will entirely extinguish the other seems to me an impossibility. In this connection a method of advertising has been used by the Welsbach people which is to say the least very unusual, and shows the confidence that the Welsbach Company has in its position and its product. Taking circulars which had been prepared by an electric light paper crying down the merits of the Welsbach lamp, and stating its demerits in an exaggerated form, it has distributed them with the following printed across the outside of the cover: "'Let the galled jade wince; our withers are unwrung.' With the compliments of the Welsbach Light Company." Compare this with the statements made 8 or 10 years ago by enthusiastic electric light men, when the gas business was referred to as "our antiquated friend," and when some gas managers were themselves a little skeptical as to the future. It shows that times have indeed changed.

In a company with whose operation I am familiar, a matter has developed in connection with the introduction of Welsbach lamps that is worthy of notice. This company supplies less than 500 houses, in most of which previous to this year the portable gas lamps had nearly disappeared, and in their place the popular and fashionable banquet and piano lamps were used. Since the introduction of the Welsbach lamps there have been sold 75 portable stands, and enough old portables which had been lain to one side have been fixed over to make the number over 100 that are now in use every evening, where previously in most of the cases oil had furnished the light. This company has not yet tried to sell the piano gas lamp brought out by Mr. Irvin Butterworth, of Columbus, Ohio, nor the elaborate colored shades which are so popular in connection with oil lamps, but I believe proposes to do so during the coming year. I think this a field of lighting that we will do well to think over carefully. Evidently many of our people, particularly the ladies, are determined to light their parlors and libraries with a light giving a color to the room which harmonizes with their complexions or their dresses or their ideas; and why not cater to that sentiment? I may be wrong, but I think it can be done, and done successfully with gas.

In the very able address of the President of the Ohio Gas Light Association, delivered last March, was this statement: "While the old adage of the gas business, that the money is made or lost in the retort house, is just as true as ever, yet the theory and practice of gas manufacture itself are by this time quite well understood. There is, of course, still ample room for investigation and study in and around the gas works, but it seems to me that the important, unsolved problems of our gas business have passed forward with the gas, as it were, from the retort house or generating plant, through the street mains and into the houses of the consumers themselves."

I desire to re-echo that statement and call your careful attention to it as being the question of all others for us to consider. Few of us, except as we have bought the raw materials lower, have made any decided reduction in cost in the retort house or gas works yard in the past five years, and it has seemed to me that the vital question now, in the management of gas works, particularly the smaller companies with an annual output of 50 million feet or less, is how to sell more gas. To this end most of us are pushing the gas stove business; many of us are introducing Welsbach lamps; a few are selling gas fixtures and various appliances for consuming gas. There has also been a decided tendency to decrease the cost of the introduction of gas into buildings, and some of the companies have done away with the charge for laying services and setting meters.

During the past year the management of the Brookline Gas Company, in competition with the Boston Gas Company, have sought to induce consumers to leave the latter Company and purchase gas from them by offering free services, no charge for setting meters, and the donation of a gas stove, with some slight conditions as to the amount of gas to be consumed in a given length of time. This has resulted, as I understand the matter, in the giving away of some thousands of gas stoves at very large cost to the Company. The proposition has been met, as it naturally would be, by concessions from the old Boston Company, and now the competition has become so strong that I have understood indirectly that in some cases piping of buildings was done without charge and fixtures were furnished. I do not refer to this simply to record the fact or to comment on it in any way. It is safe to say that the able management of the two Companies know well how best to manage their own business. I think, however, that it points in a direction towards which all of us should be looking. If it pays a company in competition to do any or all of these things, why may it not pay a company not in competition to do some, or all? There must, of course, be reason in all things; as, for instance, if instead of gas stoves money were given, we would all agree that the average consumer would be very dear indeed at $1,000, but supposing that amount be reduced to $10, it becomes a different question. Who would say that a company was not foolish if it could purchase, and declined to do so, 100 or 1,000 additional customers by an expenditure of $1,000 or $10,000, and I think many of us would go much beyond the $10 mark to obtain a respectable body of consumers. Exactly where the line should be drawn I am not prepared to say—local circumstances and surroundings would undoubtedly determine the solution of this problem in many cases; but I do believe firmly in the policy of canvassing for consumers as vigorously without competition as I would believe in it if working against the most active competitor.

It is reported in one of our gas papers that the Gas Light and Coke Company, of London, are working in the same line, and, commencing with this year, they propose to fit up without charge any house in their district with pipes, meter, brackets, burners and a cooking range, at an estimated cost of from $35 to $40 for each family. As an offset they will charge a somewhat higher price per thousand feet than for gas sold in the ordinary way, and as the gas is furnished through a prepayment meter, it becomes a cash in advance transaction, and undoubtedly some expense in bookkeeping and collecting is thereby saved. It is stated that this work, while well done, will not be such as to attract the well-to-do people, and it is evidently hoped to reach a class who are unable to pay for the introduction of gas into their houses, but who can pay for a limited quantity when once introduced.

All of the above points to but one moral: Study the question of selling gas from the consumers' standpoint, and then push the sales along these lines to the utmost possible limit, consistent, of course, with a fair return, directly or indirectly, to the gas company you represent.

The gas stove trade, both heating and cooking, seems in some parts of New England to have reached its maximum, and I have understood that in some cities fewer stoves were sold last year than the year before. This was undoubtedly due in part to the hard times and the lessened income of a great many people; but it must also be due in part to the fact that the large demand of a few years ago has been filled. A matter has been brought up this past year which, so far as it has gone, is in the

nature of a surprise, and that is the average consumption of gas in cooking stoves. A number of the gentlemen present have, I believe, made a careful study of the matter, and, in three cities at least, the figures practically agree that the consumption through the cooking range is not very far from 1,000 feet per month for the summer months. This, I am sure, is very much less than has been believed to be the fact. The question will be brought before the meeting in the Question Box, and I trust it will be thoroughly talked over.

In the President's address of the American Association, both at the meeting of 1893 and 1894, and also in the address of the President of the Western Gas Association, in May, 1894, reference was made to the use of gas for motors on street railway cars. There have also been a few articles on this subject during the past year published in the gas papers. There are in operation a few short lines in Europe, and some experiments have been made in this country which in the main are satisfactory. All of the figures show the following:

1st. A probably lower cost of installation than by any other means.
2d. A lower cost of operating than by horses or electricity.
3d. A consumption of gas per car mile of from 25 to 35 feet.

If, by any chance, the street car service of the country should be changed over in the next few years to gas power, the gas needed would in most cases come from the companies already established, and would make a very valuable addition to the list of consumers which we are now supplying. I understand that a well known firm, whose name is almost a synonym for success, will bring on to the market within a short time a gas motor for this purpose. We surely can hope for it a great success.

During the past year a scheme of federation of the various Gas Associations, which was proposed by one of our members and cared for by him at great personal sacrifice and effort, has been practically defeated. This is, I think, very much to be regretted by every one interested, as it could but have resulted in good to the business as a whole. It will undoubtedly come up again in the future in some form; but I am quite confident that the gentleman who has given so much valuable time and thought to it will not be the one who will bring it forward a second time. I am sure that our thanks are due to Mr. W. R. Addicks, who gave so freely and willingly, without the possibility of any personal benefit, for all that he has done to help on the matter of federation.

The municipal ownership question is still in the air, and I believe there are now two small plants in Massachusetts owned by the local municipalities. I cannot add to what I said on this subject last year. Probably this question will have to go much further before it reaches a definite solution, but I think there is no one within the hearing of my voice who has any doubt as to what that solution will be. When enough plants throughout the country are owned by municipalities so that their working results can be compared with those obtained under private ownership, and a fair deduction drawn, the verdict will surely be that private ownership is the best for the general public.

During the past three years a business has been developed in England and to some extent in Europe, by a firm of Americans in building water gas plants. This has been supplemented this year by a Canadian-American firm, also in the same line of work. I think it is a matter of congratulation that the advice and machinery, and all that goes to equip and manage a gas company, which we on this side of the ocean received from our English cousins years ago, can now be returned, and we trust that some of the good American gold that was exported at that time will now come back with interest.

In closing I desire to express the hope that the twenty-fifth annual meeting of the Association will be as successful as any of its predecessors. A number of excellent papers will be presented and some very interesting topics are to be brought forward for discussion. Up to the opening of the meeting the officers, especially the Secretary, have done all in their power to make the meeting a success, but the real success or failure now rests with the members themselves, and I trust when we separate to-morrow that each one will be satisfied, yes, more than satisfied, wth what he carries back to his home, and to his company, as the fruits of this meeting.

The President—I ought perhaps to apologize for having prepared an address in just this line, which is somewhat unusual, and for having gone into detail in discussing a number of subjects. It would please me very much if, instead of being referred to a committee, the paper might be discusssed here by the members, the same as are the other papers which are brought before the Association.

Mr. Lamson—I move that a committee be appointed to consider the President's address, and report to the Association on the various subjects contained therein.

The President—Of course, I will put the motion, but I hardly think it necessary. Is the motion seconded?

Mr. Wood—I second it.

Mr. Taber—I think, Mr. President, if you will yield your personal feelings, we prefer to do it in that way. The consideration of the President's Address in the open meeting in the way suggested might embarrass us in some shape; and I think it will come up better with the report of the committee. (Carried.)

The President—I will appoint on that committee Messrs. C. D. Lamson, R. B. Taber and H. F. Coggeshall.

[To be Continued.]

A Method of Permanently Protecting Underground Pipes from Electrolytic Corrosion.

By Mr. Harold P. Brown.

The recent rapid growth of electric railways through the streets of our cities has produced conditions whose seriousness is not yet fully realized. A year or so ago few people imagined that the same willing servant which moved the cars along the rails was wasting underground a large amount of its energy in corroding the gas and water pipes.

Within the past few months, however, some of the most alert railway managers have realized that they are throwing away hundreds of horse power every day in the work of injuring water, gas and subway investments, and that some day they will be called upon to make full payment for the damage done. And a few watchful city officials are discovering corroded water mains and ruined service pipes, and have traced the trouble to its source in the railway power houses. The gas and underground cable companies, however, do not yet seem to have fully realized that their pipes are also carrying the railway current, and are expending in the work their metal substance. Little has been done by the insurance boards, although they are somewhat alarmed, since their risks are greatly increased by any defects in the water supply or by any leakage of gas, or by increase of pressure on bare overhead wires. In several cities a difference of three or four volts has been found between the gas and water pipes in buildings amply sufficient, when backed by the dynamos of a large power house, to occasion mysterious fires if proper conditions are present. Indeed in several instances fires have been traced to this source.

As all of these various interests must be educated upon this subject before united action is possible, a brief explanation of electrolytic action, and the various attempts to protect underground pipes from it, may not be out of place.

When an electric current passes from one metal plate to another, through a conducting chemical compound like water, the fluid is decomposed; its oxygen appears at the positive plate, from which the current flows, and its hydrogen at the negative plate. If the metal of the positive plate will oxidize, it is corroded by the oxygen, while the negative plate suffers no appreciable injury from its contact with the hydrogen.

Aside from this oxidation of the positive plate the current tends to carry with it into the fluid some of that metal, and, if the proper solution is present, to deposit it upon the negative plate. Both of these processes require the presence of a certain amount of water; both will increase when any acid or salt is added to the water, and both are included in the term electrolysis. In the case of underground pipes and electric railway currents a slight leakage from the gas pipes, or a small amount of acid from the surface, will increase the action, and the current itself, by carrying the metal oxide into the water, reduces the resistance of the solution and tends constantly to cause a further increase of action. This increase of rate is augmented by the rusting of the joints or bonds between the rails and by their mechanical loosening through the hammer-blows of passing cars. Therefore, if a certain amount of damage to the pipes has been wrought in a year, one may confidently expect a much larger amount the second year, and so on. The maximum electro-deposition of iron is obtained from a saturated solution of sal-ammonia. In such a solution 100 amperes would remove over 3 pounds of iron in one day. Or, with the proper solution, the same current would remove over 20 pounds of lead per day. The lead calking, service pipes, and lead cable armor, therefore, sustain more damage than the iron pipe. In considering a city with large numbers of electric cars in service, the average current runs up into thousands of amperes. But the solution, held by the earth surrounding the pipes (though quite certain to have an acid reaction), is of indefinite composition, and, therefore, the rate of electrolytic action in any locality can be determined only by a test. Its rate in any soil, however, is in direct proportion to the difference of electrical pressure between the pipes and the rails. This difference can be accurately measured from the surface, and if the pipes are at any point a minute fraction of a volt positive to the rails, the corrosion is going on there at the expense of the pipes.

It is well understood that the current to drive the electric motor cars is carried from the dynamos at the power house to the trolley wires, and, after passing through the motors, reaches the rails. Here it has two paths presented to return it to the dynamos; one, through the rails and their connecting wires, and the other through the moist earth to the network of gas and water pipes, whose conductivity frequently equals or exceeds that of the rails. It then follows the pipes to within

a short distance from the power house, when it again passes through the earth to the rails and completes the circuit to the dynamos. If the positive terminal of the dynamos is connected to the trolley wire, as it always should be, the points where the current leaves and damages the pipes are generally within 500 to 1,500 feet radius from the power house. The corrosion of the pipes is, therefore, confined to a comparatively small area. If the negative terminal leads to the trolley wire, the pipes suffer corrosion within a similar radius from the end of each line of rails, and the area of damage is thus largely increased. The following diagram (Fig. 1) will perhaps make this clearer.

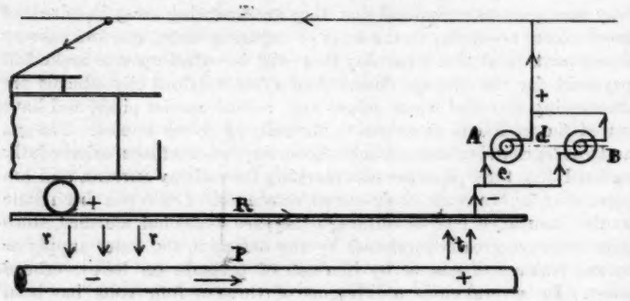

Fig. 1.

In Fig. 1, *A* and *B* represent the dynamos, whose outgoing or positive poles *d* are connected to the trolley wire *T*. The current, as shown by the arrows, passes along the trolley wire, through the trolley pole and motors to the rails *R*. Here it has a choice of returning by the rails or by passing through the earth at *r r*, near the ends of the lines, along the pipe *P*, and again through the earth to the rails at *t*, near the power house. From ¼ to ½ of the current returns upon the pipes; in other words, the pipes have to convey 370-horse power of electrical energy in the vicinity of one power house in Newark, N. J. The lead covering of telephone cables has a similar load in Boston. It is evident that at *r r*, where the current leaves the rails, the electrolytic action is at their expense; while at *t* the current leaves and corrodes the pipes. The rails are heavy enough to stand this loss without serious damage, but the pipes and their lead joints should never be subjected to it. In case the direction of the current is reversed, the rails would suffer at *t*, near the power house, and the pipes suffer at *r r*, towards the ends of the lines. The area *r r* will always be greater than the area *t*, while the current flow at *t* will be larger than the current flow at *r r*, near the end of any one line of rails, as all the current on the pipes is delivered at *t*, but at *r r* there is only the pipe current of that particular line. To accurately determine the electrical condition of the pipes many instruments are required, which, for convenience and security, should be mounted upon a suitable board supported on cushions in a carriage. There are three binding posts on the board, with flexible insulated wires, to reach from post No. 1 to the trolley wire, from post No. 2 to the rails, and from post No. 3 to the water or gas or subway pipe. The terminals of a high reading volt meter are connected to posts No. 1 and No. 2, and a second volt meter is placed between No. 1 and No. 3, each reading to 750 volts. Wires from No. 2 and No. 3 lead to a reversing switch, to which is connected a low reading volt meter and an ammeter. The former should read up to 5 volts in $\frac{1}{10}$ths and to 50 volts; the latter should read to 50 amperes. Each instrument has a separate contact switch. After connecting the wires from the binding posts to the trolley wire, the rails and the pipe, a reading is taken between trolley and rails, between trolley and pipe, and between rail and pipe; then the third key is left down while the first two readings are repeated. The third reading should represent the difference between the first and the second, unless a poor contact is made on either pipe or rail. In the latter case the repetition of the first two, while third key is left down, will indicate and locate the faulty connection. If the difference is high between pipe and rail, the current is read through the ammeter. These measurements should be made every 200 or 300 feet on all streets traversed by the electric road, and the results marked upon a map of the city.

Many remedies for pipe corrosion have been suggested; the following are the principal ones with their defects and advantages:

I. Current Reversal.—Some railway electricians have exemplified the danger of a little knowledge by advising a frequent reversal of the current, upon the mistaken theory that the metal taken from the pipes in running the current in one direction, would be restored by a run of the same duration in the opposite direction.

This is absurd, for, although the metal is corroded at and removed from the positive plate, it is never deposited upon the negative plate unless both plates are immersed in a particular solution for each kind of metal; and even then the current flow must be properly proportioned to the surfaces exposed, in order to properly deposit the metal. The practical result of these current reversals, therefore, is to corrode the pipes at *t* when the current is in one direction and to corrode them at *r r* when it is reversed; the total damage is the same, but it is scattered through a larger area and the day of starting leaks in the pipes thereby delayed. At the same time the expense of the repairs will be greatly increased.

II. Double Trolley System.—When the double overhead trolley system is used, neither the rails nor the pipes carry any current; but this system requires over each street twice as many trolley wires, twice as many guard wires, and far more than twice as many feed wires, since the rails would have to be replaced by other conductors of equal carrying capacity. It requires two trolleys instead of one, needs complicated overhead crossings and switches, is much more expensive to operate and maintain, and very greatly increases the fire danger throughout any city tolerating it. It is a serious enough fire risk to have a single bare trolley wire over each track; but when there are two bare wires close together with 550 volts pressure between them, any stray wire that touches either may easily start a fire in a distant building. And in case of a strike, one man with a light pole and a metal cross bar at its end can easily reach up and short circuit the two wires, bringing them instantly down into the street with an arc capable of following a long distance, if the current is not shut off. These and other drawbacks have practically limited the double trolley system to one city.

III. Connecting Rails and Pipes.—Many of the early electric railway constructors boldly connected their rails at intervals to the gas and water pipes. Frequently this was done without the knowledge of the owners of the pipes. In some cases the pipes were intentionally used to save the road expense for larger bond wires between the rails, and for rail feeder wires; in other cases it was done on account of the old telegraphers' tradition, long ago exploded, that the earth was a conductor of "unlimited capacity and low resistance."

Connections of this sort should never be permitted by pipe owners, as this renders the pipes liable to deliver current to the rails at *any point* and at *any time*, and also makes it impossible to accurately determine from the surface the electrical condition of the pipes, a matter of the utmost importance.

IV. Rail Bonds and Feeder Wires.—Some of the electric railway engineers insist that the only thing necessary to protect the pipes is to provide perfect bond wires between the rails and plenty of feeder wires running from the dynamos to the rails. These are both of vital importance, as at present *nearly half* the current generated by the railway dynamos at full load is wasted in merely overcoming the resistance of the conductors leading to and from the motor cars. This loss will be explained in detail in a later article.

But, assuming that the bond wires are perfect and the feeder wires ample, it is, of course, true that the current flowing on the pipes would be reduced, yet they would still carry a considerable proportion, and still suffer corrosion at the points where the current left them.

Referring again to Fig. 1, we will suppose that *R* represents four *continuous rails*, each having a cross section of 9 square inches, or 36

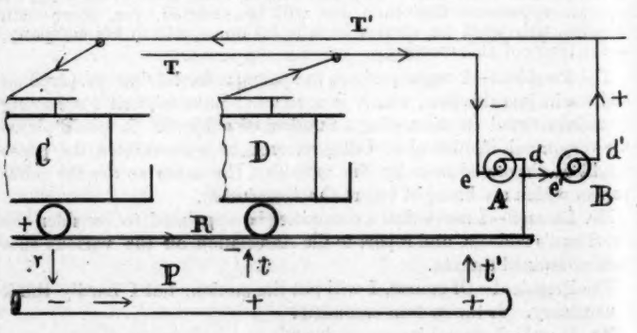

Fig. 2.

inches total. It will be found in nearly any city which meets modern requirements for gas and water service that, considering the cross-section of metal of the pipes *P* in the network, under and parallel to the rails in the same and the two adjoining streets, it will amount to about 30 square inches. The pipes are surrounded by the same moist earth that touches the rails, and they will, therefore, carry from *r r* to *t*, 45 per cent. of the current, less the loss caused by the resistance of the

earth at *r r* and *t*, and by the resistance of the pipe joints. To reduce this percentage, one half would require rail feeder wires of 36 square inches cross section—if iron, or 4 square inches, if copper wires. Even with this enormous expense, the rate of injury to the pipes would be reduced but one-half.

V. Three-Wire System.—Another method of protecting the pipes, which has been tried in a few small cities, is an adaptation of Mr. Edison's 3-wire system, which system is a great success when used for its intended purpose, the distribution of electrical energy for light and for power from stationary motors. Mr. Edison states that the use of this system for railways with bare, overhead trolley wires will not protect the pipes for the reasons given below, and that it is extremely dangerous. In this system two sets of dynamos are used, and, as shown in Fig. 2, there are two trolley wires *T* and *T'* over each street. The negative pole *e* of the dynamo *A* is connected to *T*, while its positive pole *d* is connected to the wire *f*, leading to the rails *R*, and also to *e'*, the negative pole of dynamo *B*, whose positive leads to *T'*. The current is supposed to leave dynamo *B* at *d'*, and pass through trolley wire *T'* to one-half the number of cars on the road. It divides at *r*, between the rail *R* and the pipe *P*, returns to rail at *t*, passes through the other half of the cars on the road and returns over trolley wire *T'* to dynamo *A*. If more of the cars *C* are running than cars *D*, the dynamo *B* would take the heavier load, and the pipes would suffer at *t* and *t'*. If dynamo *A* had the heavier load the pipes would suffer at *t* and *r*. If both loads were balanced, the pipes would suffer at *t*, which would be a constantly shifting point. The result would be that the entire system of pipes would be corroded in the vicinity of any line of rails; that the total amount of corrosion would be somewhat reduced, but that it would be impossible to tell from electrical measurements on the surface of the street the condition of the pipes. The advocates of this system claim that when the number of cars is perfectly balanced between trolley wires *T* and *T'* the pipes will not be damaged. This is not true, even though such balancing were possible, which it is not.

Experience proves that even in an electric lighting station it is extremely difficult to perfectly balance the lamps between the two dynamos. With trolley wire *T* over the up track and *T'* over the down track, *T'* would be overloaded when the heavy travel was down town in the morning and *vice versa*. It is, therefore, suggested that the two wires be divided between the two tracks; but there are serious practical difficulties in the way of this. The only advantage of this system would be the saving of copper wire to the railroad company. Its most serious disadvantage is the greatly increased fire risk, owing to the presence over each street of two bare trolley wires with 1,100 volts pressure between them. The ordinary trolley system is bad enough and difficult enough to maintain mechanically in position with 550 volts pressure between it and the ground; the double trolley system is far worse in both respects, as it has two trolley wires which are supported by insulated hangers from the same set of span wires, and which have 550 volts between them. But the 3-wire system, with its 1,100 volts between the two wires, is so much more dangerous and difficult to maintain that the fire risk and serious inconvenience to firemen will cause city authorities and insurance boards to oppose it as soon as its character is understood. Its proper field may perhaps be in suburban roads, and even there the trolley wires which are alongside of each other, should be of the same potential, the wires being joined to *T* in one section and to *T'* in the next section. The Brooklyn strike is an object lesson of the difficulty in maintaining even a single trolley wire against line cutters. But with this system a striker, unseen on a housetop, could easily throw a weighted wire across both trolley wires, melting them instantly and dropping their ends into the street.

[To be concluded.]

Heat Units.

By Mr. F. L. Slocum, in *Am. Mfr.*

The heating value of any combustible, like its specific gravity, must be based on some unity; unfortunately there exist three different heat units, without any specific name for each, so that they are constantly confused and used without specification as to which system they belong to. It is often difficult or impossible to determine which system is used unless you are very familiar with the subject.

These three systems are: 1st. The Centigrade or Continental system, where the Centigrade thermometer is mostly used; here the term applied to the heat unit is the calorie. 2d. The British system, used generally in England, where Fahrenheit is mostly used in scientific research; the termed used here is the British heat unit (B.H.U.) 3d. The molecule-gram system or the Thomsen system. In describing these different systems separately, the same example will be used in each, viz., marsh gas, in order to show clearly the differences.

1st. The unit of the French system, the calorie, is the amount of heat required to raise one kilo of water 1° C. Therefore the number of kilos of water that are raised 1° C. by the complete combustion of one kilo of a combustible gives the number of calories or its caloric value—*e. g.*, one kilo marsh gas, burned completely to water and carbon dioxide ($C O^2$), will raise 13,244 kilos water 1° C. As is readily seen, this same number of calories would be obtained if pounds of combustible were used and pounds of water were heated. This system will be termed, for convenience, the Centigrade-Kilo system; abbreviation, C. K.

2d. The system used in Great Britain is the same as the French, except they substitute Fahrenheit for Centigrade; this, of course, decreases the size of one calorie 4-9. Therefore the amount of heat necessary to raise 1 pound of water 1° F., is 1 caloric—*e. g.*, 1 pound of marsh gas burned completely to water and carbon oxide (CO^2) will raise 23,661 pounds of water 1° F. This is the calorie multiplied by 9–5s. This caloric is the British heat unit (B.H.U.), and for convenience will be termed the Fahrenheit-pound system. Abbreviation, F.P.

3d. The molecular gram system is based on quite a different method of determination, having no fixed unit of the quantity employed; in fact, every combustible employed is taken in different quantities, unless the molecular weight should happen to be the same as the molecular weight of some other substance. A caloric is the amount of heat necessary to raise 1 gram of water 1° C.; the quantity used is the molecular weight of the substance taken in grams.

All gases, no matter what their composition, have the same sized molecules; therefore, a molecule of any gas takes up 1 unit of room. In this system, therefore, the amount of substance used is its molecular weight taken in grams, and the caloric value of the substance is expressed in the number of grams of water that that amount of substance will raise 1° C.—*e. g.*, in marsh gas (CH^4), molecular weight 16, 16 grams of marsh gas, burned completely to water and carbon dioxide, will raise 211,900 grams of water 1° C. The caloric value in this case has the advantage of expressing the caloric value of the same volumes of substance when in its gaseous state and conveys quite a different meaning. It is the most useful system for general scientific research, but is apt to be misleading to the general technical world. It will be readily seen that it can be converted into the C.K. system by dividing the total calorics given for any substance by its molecular weight, and is further converted into the F.K. system by multiplying this result by 9–5s. For convenience we will term this system the molecular-gram system; abbreviation, M.G.

Making a comparison of the different values given above, marsh gas has its caloric value expressed as follows in the different systems:

	C.K.	F.P.	M.G.
Marsh gas (CH_4).....	13,244	23,839	211,900

These will all show the same result, and are all convertible one into the other; still, when given promiscuously, without any designation as to system, they must certainly be very confusing. The F.P., or the British heat unit, is entirely superfluous, and the sooner it is dropped from all classes of heat unit investigations the better; it is only the C.K. system converted into Fahrenheit, and a division of the number 180 will never make a clear or handy unit for general and accurate work. There are only two temperatures that can be absolutely determined anywhere in the world and be always the same. The first is a mixture of ice and water, which has the same temperature everywhere; hence it should be zero (0°), as it is on the Centigrade thermometer, being the freezing point of water. The second is the temperature at which water is converted into steam; the temperature of steam is the same always under an atmospheric pressure of 30 inches mercury or at the sea level; this can be determined anywhere, making the barometric correction, which is easily done; therefore, this temperature should be 100°, as it is on the Centigrade scale; $\frac{1}{100}$ is a comprehensive division, and certainly conveys clearer comprehension of unit than $\frac{1}{180}$, the difference between the freezing and boiling point of water on the Fahrenheit scale.

All three systems are at fault in one respect, which, however, can only be overcome indirectly, as given below, and that is, the figures given in all systems and with the lowest heating substance are high numbers. The human mind cannot grasp readily comparisons of high figures and be able, at the same time, to use them quickly for comparison. In the tables given below, there has been added another unit for all combustible

Name.	Molecular Symbol.	Atomic Weight.	Molecular Weight.	Products of Combustion.	Specific Gravity Hydrogen Equals 2.	Specific Gravity Air Equals 1.	Weight of 1 Liter, in Grams.	Weight of 1 Cubic Foot, in Grains.	Weight of 1 Cubic Foot, in Pounds.	Calories C. K.	Heat Value Carbon Equals 1.	Volume Caloric Hydrogen Equals 1.
Hydrogen	H_2	1	2	H_2O	2.000	0.06925	0.08955	39.1263	.00559	34,217.5	4.23	1.00
Marsh gas	CH_4	.....	15.97	H_2O-CO_2	15.974	0.55300	0.71506	312.445	.04464	13,244	1.63	3.09
Carbon monoxide	CO	.....	27.93	CO_2	27.937	0.96715	1.25058	546.4397	.07806	2,441.7	0.302	1.00
Acetylene	C_2H_2	.....	25.94	H_2O-CO_2	25.947	0.89829	1.16148	507.5338	.07255	11,923	1.48	4.53
Aethylene	C_2H_4	.....	27.94	H_2O-CO_2	27.947	0.96749	1.25103	546.6318	.07809	11,884	1.47	4.86
Aethane	C_2H_6	.....	29.94	H_2O-CO_2	29.947	1.03675	1.34058	585.7637	.08368	12,347	1.53	5.41
Propylene	C_3H_6	.....	41.91	H_2O-CO_2	41.921	1.45124	1.87654	819.9506	.11713	11,731	1.45	7.21
Allylene	C_3H_4	.....	39.92	H_2O-CO_2	39.921	1.38194	1.78692	780.7961	.11154	11,690	1.45	6.83
Benzole	C_6H_6	.....	77.82	H_2O-CO_2	77.822	2.69463	3.48429	1522.4659	.21749	10,102	1.25	11.51
Naphthaline	$C_{10}H_8$	.....	127.70	H_2O-CO_2	127.722	4.39880	5.68783	2485.322	.35505	9,618.7	1.19	17.98
Sulphureted hydrogen	H_2S	.....	33.98	SO_2-H_2O	33.981	1.17664	1.52147	664.802	.09497	3,488	0.43	1.73
Carbon bisulphide	CS_2	.....	75.93	CO_2-SO_2	75.931	2.62580	3.39980	1483.577	.21194	3,404	0.421	3.79
Ammonia	NH_3	.....	17.01	H_2O-N_2	17.010	0.58901	0.76163	332.790	.47543	5,332	0.659	1.33
Air	.....	.....	.....	.....	14.444	1.00000	1.29306	565.000	.08071	.....	.....	.....
Nitrogen	N_2	14.01	28.02	.....	28.021	0.97026	1.25461	548.197	.07831	.....	.....	.....
Oxygen	O_2	15.96	31.92	.....	31.920	1.10531	1.42923	624.500	.08921	.....	.....	.....
Carbon dioxide	CO_2	.....	43.89	.....	43.892	1.51980	1.96519	858.687	.12267	.....	.....	.....
Carbon from wood	C_2	11.97	23.94	CO_2	.....	.....	.....	.....	.....	8,080	1.000	.....
Anthracite—Penna	.....	.....	.....	CO_2-H_2O	.....	.....	.....	.....	.....	7,844.4	0.971	.....
Bitum'nous coal	.....	.....	.....	CO_2-H_2O	.....	.....	.....	.....	.....	8,391.7	1.038	.....
Cannel coal	.....	.....	.....	CO_2-H_2O	.....	.....	.....	.....	.....	6,365.5	0.788	.....
Furnace coke	.....	.....	.....	CO_2-H_2O	.....	.....	.....	.....	.....	7,019.4	0.868	.....
Crude petroleum	.....	.....	.....	CO_2-H_2O	.....	.....	.....	.....	.....	11,094.1	1.373	.....

substances, and a second one for gases. A pound or kilo of pure carbon completely burned to carbon dioxide (CO^2) = 8,080 C.K.; this number of calories is taken as a unit or as 1 heat value, abbreviation (H.V.), hence—Carbon (C.) = 1 H.V.

Carbon is the best, as it is the type of all combustibles, and has a middle value among combustibles. Marsh gas, 13,244 C.K., would equal 13,244 ÷ 8,080 = 1.63 H.V.

Marsh gas (CH^4) = 1.63 H.V.

That is, 1 pound of marsh gas equals 1.63 pounds of carbon for heating purposes. The decimals are only carried out two places; if over five in the third place, one is carried up; if not, it is dropped. This gives a quick, intelligent comparison for general technical use, and, it is believed, will be an aid in the general use of heat unit comparisons, as they are all based on equal weights.

In the case of gases or substances which become gases by solution in other gases, another unit is also used; this unit is used exactly as the specific gravities of gases are compared with air, while all the solids are compared with water. This unit is hydrogen by volume. Hydrogen has the highest heating value of any element or compound and is the lightest. It is unnecessary to take any given volume, but make the comparison direct from the molecule-gram system, as all gases have the same sized molecule.

The molecular weight of hydrogen is H2 = 2, hence, H2 = 68,435 M.G.; this is taken for the unit; V.C. is the abbreviation for volume caloric; so H = 1 V.C.

Marsh gas under the M.V. system = 211,900.

211,900 ÷ 68,435 = 3.09 V.C.

This makes a quick and intelligent comparison, as the numbers are low and easily grasped in the mind and far easier remembered.

The tables explain themselves.

In calculating the loss of heat in combustion the following data is necessary.

Air contains 77 parts by weight of nitrogen; it is therefore necessary to heat up to the temperature of combustion 3.347 + pounds of nitrogen to every pound of oxygen consumed.

If the temperatures of the products of combustion are known where they enter the stack or flue, with the amount of admixed air and the quantity and composition of fuel, the weight of these gases per pound of fuel, multiplied by their specific heat, will give the exact amount of waste. The specific heats of the different gases which go to make up products of combustion are:

	Specific Heat.
Air	0.2377
Carbon dioxide (CO^2)	0.1843
Nitrogen (N^2)	0.2438
Oxygen (O^2)	0.2175
Water (H^2O) (gaseous)	0.4805
Water (H^2O) (liquid)	1.0000 at 0° C.
Carbonaceous oxide (CO)	0.2425
Sulphurous oxide (SO^2)	0.1544

Argument by the Hon. Henry C. Kelsey before the House Committee on Municipal Corporations of the New Jersey Legislature in Opposition to the Proposed Dollar Gas Rate for Certain Cities of that State.

Mr. Chairman: Bills of this character are not strangers in these halls; they are veterans, regular old soldiers; indeed, I may say, tramps. Scarcely a legislative session has been held, for 20 years or more, that they, or like bills, have not made their appearance, but heretofore they have not been received with favor by the Legislature, and I trust they may be adversely considered now. Never before, Mr. Chairman, has there been so little reason for the enactment of such legislation, nor so little popular demand for it, for the excellent reason that the objects sought to be attained thereby have been already accomplished by ordinary business methods. The price of gas wherever it is sold in this State is lower at this time than ever before. Reductions have been made from time to time as the conditions of the business warranted, until now the price at various points in New Jersey is lower, prevalent conditions considered, than in almost any other State.

Let us look for a moment at the ruling prices in Newark, say, for the past 20 years. In 1872 the price per 1,000 cubic feet was $3.50; in 1876 it was reduced to $3; in 1880 to $2.50; in 1884 to $2; in 1889 to $1.60, and in 1893 to $1.40. That price prevails now. These, you will bear in mind, are the outside figures. There, as elsewhere, discounts have always been made to large consumers; therefore, the average price realized by the companies has been materially less than the figures stated. During this period the standard of quality has been steadily advanced, and large outlays made to improve the service. During a portion of this time prices have been as low, sometimes lower, as in Philadelphia, where the gas works are owned and operated by the city.

Gas is sold in England lower than anywhere else in the world; formerly the price in London was $3.75, then $3, then $2, and so on down, until now gas is sold there at prices which are impossible here; but the output is enormous and the conditions most favorable in every respect.

These reductions were not compelled by methods prevalent in the dark days of England, the revocation of charters, etc., which have been cited here as occurring "about 120 years ago," nor yet by Act of Parliament, but were the result of the policy of common sense, which governs business enterprises in Great Britain as well as in the United States. England was doing and attempting to do a good many things "about 120 years ago" that have never been regarded with unmixed approbation in this country. My friend was a little unfortunate in fixing the date of his precedents.

In Pittsburgh, the fountain of natural gas, and where coal is virtually shoveled directly from the pit into the retort, the average price received by the local gas companies in 1893 was $1.09 per 1,000 cubic feet, while the sales exceeded 1,364 millions (1,364,514,538) cubic feet. In this State the sales of no company have ever reached 500 millions cubic feet per annum. Considering the conditions prevalent at Pittsburgh and at any point in New Jersey, $2 per 1,000 here would hardly be in excess of $1.09 there. In New York the price is $1.25 and the sales

nearly 10,000,000,000 cubic feet per annum; in Brooklyn $1.25 with sales of over 3,000,000,000; in Philadelphia over 4,000,000,000 cubic feet are sold; the price there prior to 1894 was $1.50, but it was reduced early in that year to $1. The city owns and operates the works, remember, resulting in no increase of business and in a great loss in operating the works as I shall presently show.

These bills, as I have said, are veterans. They appear in the same garb from year to year, save now and then a patch in the form of lower price, otherwise they wear the same old clothes. Not a word is altered or added as to service or quality. Twenty years ago they called for 14-candle gas, and that is the requirement now. It might be expected that these figures would be increased as the price was reduced; that has been the actual practice of the companies, in keeping with the progressive spirit of the age. Now, on the question of quality, Mr. Chairman, the fact is that no first-class company in the State puts out gas of less than 20-candle power. A company selling gas by the standard fixed by these bills would not be long in entering the always open portals of the Court of Chancery.

The distinguished Congressman-elect from Hudson county opened his argument on these bills by an attempt to give them a political tinge, which the astute Chairman of the Committee appeared to think a little out of the proper line. In other years, other legislators from Hudson county (whence these bills have always come) have also, to my knowledge, been disposed to give them a political turn; but in every former instance the parentage has been of that political type which prevailed so largely and uniformly in Hudson prior to last year.

Not many years ago a Democratic member from Hudson fathered many bills of this class, among them these very bills, but the price was higher—$1.25—(he was not a low-priced legislator). Another favorite measure of his was to forbid the use of barbed wire fences, and to require all those then erected to be destroyed. These bills never grew to know their father, however, but during his time another bill, which in due course became a law, "fathered" him very snugly. He became "Chief of the State Police," at the comfortable salary of $2,500 per annum; but the man who knows of any service he ever performed in return has yet to be discovered.

More recently, another of the late lamented majority, the representative of Guttenburg, who was not re-elected last fall, "started" the gas bills, but the reform of Guttenburg was accomplished, while the gas reform failed.

I remember, Mr. Chairman, a remark once made to me by an honored Republican about these bills. "How is it," he said, "that your Democratic friends from Hudson are always introducing such bills?" (I forbear quoting him verbatim.) I replied, "I do not know; maybe when your people are more numerous in the Legislature the bills may come from them." "Not at all, not at all," was his quick answer; "Republicans do not introduce such bills;" but neither he nor I then expected to live to see an Assembly composed of 54 Republicans and 6 Democrats.

The gas interests of this State are managed by citizens of the very highest standing—men trusted and honored in their several communities, and throughout the State. I need but name Eugene Vanderpool, John L. Blake, ex-Chancellor Runyon, Franklin Murphy, George B. Jenkinson, Judge Kirkpatrick, the Ballantines, and, in his lifetime, that noble Jerseyman, ever to be remembered for his many virtues, his lofty patriotism, and his devotion to the State, George A. Halsey—all these of Essex; and in Union, John Kean and his lamented father; in Mercer, John S. Chambers, Barker Gummere, A. G. Richey, Fisher and Parker; in Passaic, Hobart and Bell; in Hudson, Dod, Gordon, Edge and Freeman Smith; in Camden, Archer, Cooper, Richard Fetter Smith and Charles Watson; in Middlesex, Col. Newell, Janeway, Kirkpatrick, Carpender, Ross and Willard Voorhees. These, and their associates, are trustees of our citizens, who, reposing confidence in the good faith of the State, have invested in gas securities. Every name I have mentioned is synonymous with honor and integrity. These are not men who would "wring," as has been said here, money from the people or any citizen. They are men of business training and experience, honorable and astute, often trusted by the people in positions of responsibility, and they have never faltered in faithfulness to any trust confided to them. Reflections upon their business sense and integrity will not be listened to with patience by those who know them personally or by repute.

I am unable to state from data, but it is safe to estimate that there are more than 10,000 holders of gas securities in this State. I know the stocks are widely distributed, and in many instances the individual holdings amount to a few hundred dollars only. The enactment of these bills would be a serious and cruel blow to these interests. Frequently estates, families, women and children are solely dependent upon their revenue, often small, from their investments for support. Such legislation would very seriously impair the value of every dollar invested in gas securities, and in many, if not in all cases, utterly destroy the earning of dividends, and financial institutions having loans upon them would demand payment at once.

I shall not discuss the legal phases of such legislation, although I have a very decided opinion upon that branch of the question. The honorable gentleman who opened the discussion clouded his case on that point by his own observations at the outset, and he was careful not to hazard his legal reputation by declaring that even in his opinion these bills would stand the test of judicial scrutiny, and in that connection he advanced the extremely novel theory that the duty of the Legislature was to pass bills on the score of expediency, leaving the question of legality to be determined by the courts! Adopt this idea, gentlemen, and the pending legislation for the re-organization of our courts will require very extensive expansion, and the legislative sessions will run into midsummer. Let that be the rule, and the occupation of the lawyer in the Legislature is gone. I was pleased to note how quickly that proposition aroused your professional pride, Mr. Chairman.

The real questions, however, are, Is the proposed legislation honest? Is it just? Gas companies, as well as other corporations doing business in this State, operate under authority of grants by the Legislature, in some cases under special acts, but more commonly by virtue of general laws. These laws confer certain powers and impose restrictions and obligations; but as to gas companies, in no case is the price to be charged for their product fixed or indicated, nor is there any reservation to the Legislature of such power. They fix a standard of quality and establish certain conditions, but in not a single instance do they set up a scale of charges. And why should they? They might with equal or greater propriety establish a scale of prices for labor and materials required for the conduct of the business. It would be rank injustice to fix arbitrary and unchangeable prices for gas, without in like manner fixing the price of coal, petroleum, naphtha and labor.

These, then, are the conditions under which capital has been invited to invest in gas property in New Jersey; with notice as to what the State had granted and required, and with confidence in those concerned in the management of the business, our people have sought these channels of investment, uncertain, of course, as to the outcome, but with confidence and hope in the management, and faith in the honor of the State. It is lamentable, Mr. Chairman, that these rude shocks to the integrity of the State should occur.

The public burthens of gas companies are numerous. The gas and electric light companies of this State have paid into the State Treasury, under the Corporation Act of 1894, $335,750.75; this in addition to the ordinary State, county and municipal taxes; and now comes the odious income tax, which will fall heavily upon them.

Mr. Chairman, gas investments are not uniformly profitable. There are numerous companies in this State that paid no dividends in the early years of their existence, and in some cases dividends have been suspended because of unusual outlays necessitated by accidents in the works or otherwise.

Gas property is a hazardous investment at best, and gas bonds, paying, say, 5 per cent., do not, as a rule, sell as high on the market as railway or other 5 per cent. bonds. Municipal and many railway bonds at 4 per cent. sell readily, while a 4 per cent. gas bond is unknown and would not be looked at by investors.

In 1878, when electricity first came into practical use for lighting purposes, gas stocks fell in price all over the world, from 30 to 50 per cent., and even more. It was said, and by many believed at that time, that gas was "played out;" but while electricity has made tremendous progress, gas still remains.

These bills make no provision for the constantly changing conditions of this progressive age, nor for any contingency whatever. Their enactment would absolutely ruin more than one gas company of this State.

In past years circumstances have occurred which caused gas companies to pay exceedingly high prices for coal, and in some cases to import it from England. Labor strikes have occurred, and on that account and others the business of gas companies has been entirely paralyzed. Gas managers are on the alert to develop the uses, and so extend the magnitude of their output. For instance, 25 years ago the gas stove was practically unknown in this country; now they abound, and are effective, cheap, clean and convenient.

The gas engine was introduced here only about 20 years ago. There was then but one make; now the varieties are many, and they rival

steam in point of convenience, and, all conditions considered, economy. Again, as to standards of quality and service. In the earlier days of gas lighting a light hardly greater than one candle was obtained from one foot of gas; later this was increased to about 3 candles, and now, by the incandescent burner, just being put into practical use in the United State, a light equal to at least 15 candles per foot of gas—its promoters claim still greater results—is obtained. With this burner, gas at $2 is cheaper than at $1 with the old burners in common use. And it is true that every progressive gas company is interesting itself in introducing this gas burner, because the results to the consumer are more satisfactory, although the output of gas may be reduced.

Wise management by gas officials, in the interest of stockholders as well as for the benefit of the public, demands low prices and good service, and this is the policy pursued by almost every gas company I know in the State. The days of old methods and high prices for gas have departed, and the manager who would adhere to them now finds himself walking the highways looking for a job.

Your Chairman, gentlemen, has well referred to prevailing conditions in different localities in regard to the gas business. The facts and figures which I present show the justice of taking these conditions into consideration in determining what is a fair price for gas in New Jersey; what may be a reasonable and remunerative charge at points nearby the coal and petroleum fields of Pennsylvania, Ohio, Indiana and other States would be ruinous here.

In New York City the annual sales are over 6,000,000 cubic feet per mile of main, and the total output nearly 10,000,000,000, while no company in New Jersey sells as much as 500,000,000 cubic feet per annum, and the sales per mile of main will not exceed 2,000,000 cubic feet.

One of our largest companies has over 155 miles of main pipe, but the number of consumers per mile is only 51, and there are many miles laid where the consumption hardly pays the expense of collection. For every consumer there is an average outlay of capital, for street mains alone, of about $75.

Reference has been made to the matter of probable increase of business as the result of reduction of prices; experience, however, does not justify this theory. In Philadelphia, where the price of gas was reduced from $1.50 to $1 about a year ago, the subsequent business, as I am officially informed, showed little if any increase. In Newark the percentage of annual increase at the price of $1.40 has not been as great as when the price ruled from $2 to $2.50.

In Philadelphia, during the year 1894, after the price had been reduced to $1 per 1,000 cubic feet, and in consequence a deficit in the accounts of the Gas Bureau was apprehended, a Special Committee of the Select Council was appointed to consider the subject. Their report showed that there should be a profit on the year's business, as compared with that of 1892—the most successful in the operation of the works—of $178,246, but this makes no provision whatever for interest on the cost of the works, which, as stated by the Director of Public Improvements, was $14,726,736. Charging only 5 per cent. on this sum, gives $738,136, and counting the wear and tear at only 2 per cent., $295,254, would show a deficit of $855,145; but nowhere in this calculation, it will be noted, is account taken of the taxes which the city would have realized had the works been owned by private parties. Adding a fair sum on this account, would make a deficit of over $1,000,000 in a single year. These conditions seem to have caused the city fathers of Philadelphia much anxiety, for in May last a resolution was presented in the Common Council, the preamble of which was as follows:

Whereas, The price of gas has been reduced to $1 per 1,000 cubic feet, in consequence of which it had been expected that the consumption would have been very materially increased, through the introduction of gas stoves, gas engines and other appliances; and

Whereas, The consumption of gas has not increased, but, on the contrary, we are officially informed, there is a decided decrease in the receipts for gas, due to such reduction.

Then followed the resolution, which requested the Director of Public Works to inform Councils what, in his opinion, could be done to lead to a more general use of gas.

In London more than 88,000 dwellings are not lighted by gas, but use coal oil, candles or other luminants, and this is but a section of the city only—South London. In Liverpool, less than 13 per cent. of the people use gas. In Bristol, only 7 per cent. In Tunbridge Wells, out of 5,300 houses, less than 3,000 use gas, and over 120,000 gallons of coal oil was sold in that city last year. These are but sample figures, but they fairly show that even in England, where gas is lower than anywhere else in the world, and coal oil is dearer than in America, only a small proportion of the people use gas. The truth is that the great competitor of gas for lighting for the people is coal oil, and it is very doubtful if the consumption of gas for lighting purposes would be greatly increased in this country should the price be reduced as low as 75 cents or even 50 cents per 1,000 feet.

Why, in Wheeling, West Virginia, where, with coal and petroleum at their doors, gas is sold, I believe, for 75 cents—lower than anywhere else in this country—and the population is over 40,000, less than 3,500 houses use gas.

The popular impression that gas is, or is likely to become, the light for the million, is wholly erroneous, Mr. Chairman.

On the other hand, those who do not count the cost closely now use the brilliant and handy electric light. So that gas encounters the keenest competition on every hand.

In regard to the petition presented from Hudson county for the passage of these bills, upon which some stress has been laid, I need not say that one of the easiest things in the world is to get a petition signed. How many signers of this paper are consumers of gas, or ever have been or are interested in the matter in any way, I do not know; but as I have shown, this question is not one which interests the million. Gas is not, and probably never will be, a light of universal adaptation. Chancellor Zabriskie once said, in the Court of Pardons, in commenting upon a very largely signed petition for the pardon of a man who was in the State Prison for the third time, that petitions as a rule were utterly worthless, and added that he had no doubt that numerous signatures might be obtained to a petition to hang an innocent man; the inference being, of course, that people are wont to sign carelessly, and often without knowing what is the purport of the paper to which they affix their signatures.

And now, gentlemen, I am obliged to take some notice of a most ridiculous, but at the same time, mischievous feature of this hearing. I refer to the figure cut by Mr. Levi Stevens, introduced by the advocates of the bills. The statements he has made, and the importance attached to his figures and to himself, as a gas expert, by the friends of these measures, are absurd. I have met Mr. Stevens before. He first suffused this rather gloomy town with the brilliance of his 24-candle gas intellect and the rays of his surpassing science some seven or eight years ago. He favored me with an early call, and unfolded his scheme of making the best gas ever produced at the lowest price ever known. I listened patiently, and asked him if his methods were in practical use anywhere. He replied in the negative. I then referred him to two well known gas engineers, experts in the business and of large experience. He went to them, or certainly to one of them, and they emphatically condemned his scheme. After vicissitudes of but little variation, downward with great uniformity, he succeeded in interesting some gentlemen of this city in his scheme to furnish gas to the State Prison. This was about the year 1892. Some years prior to that the State had erected gas works on the prison property, and after operating them unsuccessfully for some time, was about to abandon them.

There was a retort house, scrubbers, purifiers, condensers, tanks, holders, mains, and all the paraphernalia of a modern gas establishment. All of these were turned over to Mr. Stevens, without the outlay of a cent on his part, and he undertook to make and deliver gas into the holder at $1 per 1,000 cubic feet.

Now mark the conditions. The State furnished all the property and apparatus, save what one of the advocates of these bills described as "a little machine, not larger than the Speaker's desk in the Assembly Chamber." Here, then, was Mr. Stevens' opportunity—with everything at his hand, and not a dollar invested, except for the "little machine," he has been charging the State $1 per 1,000 cubic feet of gas, measuring it as it comes from the machine, and, therefore, without the loss of a foot. He has no rent, taxes, nor cost of maintenance or repairs to pay; he has but one customer. The bill is paid by the State Treasurer monthly, and although Mr. Stevens himself has said here that he can make gas, with his own plant and property, for from 18 to 22 cents per 1,000, he charges the State $1 per 1,000 cubic feet for every foot he manufactures. You may depend upon it, gentlemen, there is not a gas company in the State that would not jump for that job. How Mr. Stevens can square his conscience with the charge of $1 at the holder for gas which, by his own statement, he can make for 22 cents, I cannot quite understand; but some people think there is a difference between "wringing" money from the State and "wringing" it from individuals.

Let us scrutinize Mr. Stevens' operations at the State Prison a little further. He furnishes nothing, save the "little machine" and the requisite materials. For the year ended November 30th last, he drew from the State Treasury $6,002 for gas supplied to the prison; therefore, the price being $1 per 1,000 cubic feet, the quantity furnished must have been 6,002,000 cubic feet. Now, if Mr. Stevens produced this gas at a

cost of 22 cents per 1,000 (his own outside figures), it requires but a small sum in arithmetic to show that he has pocketed the handsome profit of $4,681.56 on the business of a single year, and this on a total investment of $3,400, by his Heat, Light and Power Company, as shown by the records of the State Department. If there is a gas company in the State that equals this, I should like to know where it is located.

You will please note, gentlemen, that Mr. Stevens has but a single customer, paying him $6,000 a year, while many of the companies in New Jersey do not average that amount of revenue from 300 or more customers.

He collects for every inch of gas he manufactures, delivering it only into the holder, which is but a few feet from his "little machine." They deliver it miles and miles away, and the loss from leakage and other causes is rarely, if ever, less than 10 per cent. of the total output; in many cases it is from 15 to 20 per cent. They collect in dollars, while he collects by thousands. They have many bad accounts, while the State always pays. They have the cost of maintenance of an immense system, while he has no cost at all. They pay taxes and charges amounting to thousands, while he pays little, if anything. The exact sum his Company paid into the State Treasury last year was $3.40. The truth is, Mr. Chairman, that Stevens' price of $1 at the State Prison is much higher, all things considered, than the rate charged by any gas company in New Jersey.

But, gentlemen, Mr. Stevens is not a gas expert at all. He has had his opportunity at the prison; he has been operating his "little machine" there for years, but, up to this moment, he has not been able to get anyone to invest a dollar in his scheme. What nonsense for him to come here and talk about having millions back of him! Nor has he had "40 years' experience in the gas business," as he states. He has never devised nor constructed a successful gas apparatus in his life; he induced one of our leading manufacturing concerns, the Trent Tile Company, to invest in his scheme; utter failure and total loss followed; he persuaded some of our citizens to back him, not with millions, but with thousands, at Atlantic City; every dollar was lost and the undertaking abandoned. I am familiar with other of his undertakings, but I forbear enumeration. The result has been the same in every case.

Nor is Mr. Stevens' experiment at the State Prison a success. The gas he furnishes is not of uniform quality; it is not satisfactory to the officials in charge, and I do not hesitate to assert that the State, under management of the present prison officials, could manufacture its own gas, of a far better quality and at a materially less price than under the Stevens plan.

Not many months ago Mr. Stevens presented some such figures as he has submitted here before the Board of Trade of this city. I challenge his statements there, and in answer to my questions he again stated that his scheme was not in practical operation anywhere. The fact was, and is, that wherever it has been tried it has proved a failure and been abandoned, and all those who have been induced to invest in it have suffered loss. Facts, in corroboration of this statement, will be submitted to you at the proper time by one of Mr. Stevens' victims, a citizen of this State of the very highest standing.

But further, Mr. Chairman, there is nothing new nor novel whatever about Mr. Stevens' methods nor his machine. Gas making machines of various makes have been in use for many years, some of them with excellent results; and a contract can be made to-day for a plant of ample capacity to supply the State Prison with gas, under an absolute guarantee of satisfaction, at a cost of not more than $3,000. There are many such machines in use in large establishments, a number of them in this State. If Mr. Stevens' scheme had any practical value, if he could demonstrate that he could accomplish the results which he claims for it, he would not to-day find himself running a "little machine" at the State Prison.

The lamented Dan Holsman, once a brilliant Senator from Bergen county, used to say, "Figures will lie;" and while I use no harsh word in characterizing Mr. Stevens and his figures, I respectfully submit, Mr. Chairman, that they are utterly unworthy any serious consideration whatever.

I feel, gentlemen, that I should apologize for referring at such length to Mr. Stevens' statements. I have only the kindliest feelings for him. You know how persistently his identity was concealed by himself and the worthy gentleman from Hudson who introduced this bill. And you may have wondered why it was that we were not content to let the figures remain, without the identity of the author being known; but there are some statements, gentlemen, that do less harm than those of an anonymous character. Now Mr. Stevens' statements and figures are before the public, through the medium of this hearing, and it is but fair that his character as a gas expert and his record as a gas promoter should go to the public though the same channel.

The subject, to my mind, Mr. Chairman, condenses itself into these propositions:

1st. That the business of making illuminating gas in New Jersey is in the hands of reputable citizens.

2d. That it is managed with every regard to the demands of this progressive age.

3d. That the companies have from time to time improved their product and lessened the price.

4th. That to-day the price of gas in the cities and towns of New Jersey is as low as in any other place at all comparable in the important points of accessibility of material, density of population and volume of output.

5th. That the price of gas is fixed by the universal law of supply and demand, and is not a proper subject for legislative edict, and especially under a system of government which does not guarantee any fixed cost for the materials or the expense of manufacture and distribution.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AMONG other recent contracts taken by the United Gas Improvement Company, we notice the award by General Manager Leetch, of the Washington (D. C.) Gas Light Company, of one, for certain oil storage tanks, aggregating 300,000 gallons capacity. The construction will be divided, one-half the capacity to be allotted to the old station, at 27th and F streets, and one-half at the new East Side station.

MR. A. L. CRAWFORD has been appointed Chief Inspector to the Consolidated Gas Company, of New York city.

AT the annual meeting of the Washington (D. C.) Gas Light Company the Directors chosen were: Messrs. John R. McLean, William B. Webb, James W. Orme, John C. Bullitt and George T. Dunlop—all re-elections.

ARCHITECT CHATTEN, of Quincy, Ills., has been directed by the proprietors of the Quincy Gas Light and Coke Company to make plans for the proper fitting and embellishment of the new office building, No. 111 South 5th street.

A PECULIAR fatality is reported from the East Norrie iron mine, near Ironwood, Mich. The mine is lighted by electricity, and the wires are usually carried through iron pipes. A timberman named Jacobson, while working in a shaft, sat on one of these conduits, and placing his hands on the conduit, received a shock causing his instant death.

AT the organization meeting of the Directors of the Springfield (Mass.) Gas Light Company the officers chosen were: President, William H. Haile; Clerk, E. S. Brewer; General Manager, S. J. Fowler. The Directors also discussed the advisability of extending the mains to the suburb of West Springfield, and the matter was eventually referred to a special committee, comprising Messrs. Haile, Goodhue, Rumrill, Merritt and Fowler. The tone of the discussion was in favor of the proposed extension, and it is more than likely that a water gas auxiliary plant will be installed at Springfield, the output for the year just passed in Springfield proper having approximated to 100,000,000 cubic feet.

AMONGST the petitions before the Massachusetts Legislature is one praying that the telephone companies be put under the supervision of the State Board of Gas and Electric Light Commissioners.

AT the last meeting of the Board of Directors of the Green Bay (Wis.) Gas and Electric Light Company, Mr. T. G. Littlehales, the recently appointed General Manager of the Company, was elected to fill the vacancy on the Board caused by the resignation of Mr. Carroll Collins, formerly President and General Manager of that Company.

THE businesslike efforts of Mr. Charles V. Newman, aided by the liberal policy of the proprietors of the Peoria (Ills.) Gas Light and Coke Company in selling gas for fuel purposes at 75 cents per 1,000 cubic feet, have resulted most profitably by the extending of the Company's output in this field. Mr. Newman took charge of the fuel end of the Company's business on April 1, 1894, and up to date he has placed 315 gas ranges and a goodly number of hot plates and other gas-burning devices. This year, Mr. Newman says, if times are anything like good, his Company will do at least one-third better.

THE Committee on County Buildings, of the Auburn (N. Y.) Board of Supervisors, has contracted with the Auburn (N.Y.) Gas Light Company to light the Court House, Clerk's Office and Armory for the next two years with gas, at the rate of $1.15 per 1,000 cubic feet.

MR. JOHN J. KIRK, Chief of the Bureau of Lighting, Philadelphia, Pa., in his report to Director of Public Works Windrim, respecting the lighting of the streets of the city for 1894, notes that the amount appropriated to the Bureau was $421,879, and the transfers to this account were $1,200, or a total of $423,079. The expenditures were $420,536.03. On January 1, 1894, the total number of public lights of all kinds was 34,900, which included 3,584 electric arc lights. The whole number on December 31, 1894, was 38,111, which includes 5,386 electric arc lights, an increase of 3,211 lights. The total number of gas lamps discontinued during the year, on account of the proximity of electric lights, was 4,358. The report shows that in 1893 the amount of gas used by the public street lamps was 503,869,600 cubic feet; during 1894 the quantity used was 516,549,877 cubic feet—an increase of 12,680,277 cubic feet.

AT the annual meeting of the New Britain (Conn.) Gas Light Company, the officers chosen were: Directors, G. M. Landers, H. E. Russell, James H. Eddy, A. J. Sloper and A. P. Collins; President, G. M. Landers; Secretary and Treasurer, A. P. Collins; Superintendent, E. C. Learned.

THE Delaware County Gas Company, of Chester, Pa., rejoices in the fact that its new holder will put the Company in shape to supply its customers satisfactorily for some time to come.

THE standard Lowe water gas apparatus, constructed by the United Gas Improvement Company for Manager Doan, of the Jacksonville (Ills.) Gas Light Company, has been put into operation and is said to be working well within the promise of the contractors.

AT the annual meeting of the stockholders of the Lincoln (Neb.) Gas Company the officers chosen were: Directors, D. E. Thompson, J. D. Macfarland, H. J. Walsh, J. M. Raymond and J. K. Honeywell; President, D. E. Thompson; Vice-President, J. D. Macfarland; Secretary and Treasurer, J. K. Honeywell.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has finished the new generating house for the Bay State Gas Company, at Boston, Mass. The building is 51 feet wide and 146 feet long, with iron roof trusses and iron purlins covered with slate.

THE Stacey Manufacturing Company, of Cincinnati, Ohio, has just been awarded a contract by the Washington (D. C.) Gas Light Company for the construction of a 3-lift holder, the capacity of which is rated at one million cubic feet. The holder is to rest in a steel tank, the diameter of which is 125 feet 6 inches. The outer lift is 123 feet in diameter by 30 feet deep. The holder, in fact, will be an exact duplicate of the one recently erected by the Stacey Company for the Mutual Fuel Gas Company, of Chicago. The Stacey folks are also constructing a steel hydraulic main for 52 benches of 9's, for the new retort house of the Cincinnati Gas Light and Coke Company's West Station. Still another contract on the Stacey books calls for a holder and purifiers for the new gas plant at Ocala, Fla. Take it all-in-all, the Stacey Company is well satisfied with the business outlook for the year.

MENTION of the fact that the new holder for Washington is a duplicate of the one recently completed for the Mutual Fuel Gas Company, of Chicago, recalls the further fact that that holder was contracted for last October, and that is was erected in 42 working days. Gas was turned into the vessel the last week in January. The working test could not be made at an earlier date, because of the delay occasioned by the Gas Company in completing the necessary connections.

AT the annual meeting of the Independence (Mo.) Gas Light and Coke Company, the Directors chosen were: D. Bullard, C. C. Chiles, Wm. McCoy, W. A. Findlay and R. D. Wirt.

NOTICE is given of the incorporation of the Bloomington (Ills.) Gas, Electric and Steam Heating Company, by Messrs. S. P. White, J. P. Smith, R. T. McDonald, Jno. J. Patterson, George McIntosh, John Eddy and A. E. DeMange. The capital is put at $50,000, and the objects are said to be "to construct, purchase and operate plants for the manufacture and distribution of gas, electricity and steam."

THE Detroit (Mich.) *Free Press*, of the 8th inst., says that on the previous day the official gas inspector (Mr. Krecke) made his first official test of the candle power of the gas furnished by the Detroit Gas Company, and found it to be of 20.82-candle power—a very good showing; for the ordinance requires that the gas must be of 18-candle power, and if the monthly average of the tests, made twice a week, as prescribed in the ordinance, falls below 18, the Company is obliged to reduce its rates *pro rata*. As a matter of fact, the inspector will make tests of the gas every day. He also tested the gas as to its purity, and found that it was of very good quality and free from the obnoxious sulphureted hydrogen and ammonia, as well as other impurities.

THE following action was recently taken by the City Council of Waterbury, Conn., and the same was assented to by the Mayor: *Voted*, That the City Attorney be and he is hereby requested to prepare and draft an Act which will exempt the city of Waterbury from the provisions and conditions imposed by the Act passed by the General Assembly of the State, at the January session thereof, 1893, entitled, "An Act authorizing cities and other municipalities to establish plants for the manufacture of gas and electricity," and that he present the Act so prepared to the present General Assembly for action, and that he and the Senator from that senatorial district, and the Representatives in the said Assembly from the town of Waterbury be and they are hereby requested to procure the passage of said Act so prepared by the City Attorney.

MR. J. C. RAWN, the capable manager of the Roanoke (Va.) Gas and Water Company, was elected President of the Association of Engineers of Virginia, at the meeting of that body, held on January 26th.

THE American Gas Engine Company, which controls the right for the manufacture and sale in this country of the English gas engines of the Kilmarnock type, which are under the English proprietorship of Messrs. Dick, Kerr & Co., limited, of London and Kilmarnock, proposes to engage in business on a large scale. The builder of the engines in this country is the Western Gas Construction Company, of Fort Wayne, Ind., and the main business offices of the Company are to be located in Philadelphia. Mr. W. W. Goodwin, President of the Company, says that it is proposed to manufacture engines up to 600-horse power.

A CORRESPONDENT, writing under date of Feb. 8th, forwards the following: The Cleveland Gas Light and Coke Company intends attempting to demonstrate to the city government that gas is a better illuminating medium than electricity. When it was decided to authorize the Electric Lighting Company to continue lighting Euclid avenue to Case avenue, the gas company secured permission to light the same thoroughfare from Case avenue to Willson avenue. Mr. Malcolm S. Greenough, President and General Manager of the Cleveland Gas Light and Coke Company, when asked what the Company proposed to do in the premises said: "We have not yet decided just what lantern we shall use, nor just how many lights we shall erect. But we can put three times as many lights as are at present used for the money it would require to light the street with electricity. As soon as the cold weather abates we shall proceed to the lighting of that section of street with an increased number of lights, and I think we can show that for the same money the people of Cleveland can get a more acceptable and better diffused light with gas than with electricity. In Europe, the people of the large cities have grown tired of electric lighting for streets, and the last five years have witnessed a great falling off of the number of electric lights used. The people there will not allow the overhead wires and they do not like the blinding light. I cannot conceive a much worse lighted street than Euclid avenue is at present. The light is dazzling near the electric lights, but a little way from them the darkness is as black as possible."

JOHN E. ALDER and Cecilia Alder, residents of Detroit, who were injured by an explosion of gas in that city last summer, have instituted suits against the Detroit Gas Company, the Detroit Telephone and Telegraph Company and the city of Detroit, the damages being named at $10,000 in each suit.

THE postponed annual election of the Consolidated Gas and Electric Company, of Batavia, N. Y., was finally brought off on the afternoon of the 7th inst. The Directors chosen were Messrs. S. D. Purdy (Rochester), C. H. Caldwell, John P. Casey, Oren C. Steele (Batavia), and R. L. Kinsey (Buffalo.) Mr. Purdy replaces Mr. John Thomas. The Directors subsequently perfected the following organization: President, S. D. Purdy; Vice-President, John P. Casey; Secretary and Treasurer, C. H. Caldwell.

ACCORDING to the Minneapolis (Minn.) *Journal*, Gas Inspector Meeds, of that city, made five analyses during the month of January to deter-

mine the quality of the gas supplied to consumers by the Minneapolis Gas Company. The average of impurities found was as follows: Ammonia, 1.17 grains per 100 cubic feet; sulphur, 4.92 grains; sulphureted hydrogen, none. The ordinance provides that the amount of ammonia shall not exceed 5 grains, and the amount of sulphur shall not exceed 20 grains. The Inspector, however, did find a nitrogen content of 5.86 per cent.

THE disagreement between the authorities of Salt Lake City and the proprietors of the local Gas Company over the public lighting of that place continues, and the Mayor favors a settlement of the moot points through the construction of a lighting plant to be operated on municipal account. In his annual message to the City Council he makes the following reference to the matter: "Lighting the city is a matter which demands earnest, careful consideration. I think steps should be taken to ascertain whether the City Creek is capable of furnishing sufficient power to light the city, and if so, steps should be taken to utilize this power for that purpose. The city having its own plant, operated by its own cheap motive power, there would be no inducement on the score of economy, as now, to confine the lights to a small area in the more populous and luxurious portions of the city, but on the contrary, as I am thoroughly convinced investigation will show, the whole of the city, or at least all except the most remote and sparsely settled portions thereof, can be lighted for nearly the same amount of money we have for several years last past been paying for lighting a comparatively small area of the same, and the valid objection to the inequitable system of lighting a small portion of the city at the expense of the whole would thereby be practically overcome. In consideration of the present expensive, inequitable and unsatisfactory method of lighting the city, I earnestly urge a careful consideration of the matter. While the financial condition of the city is at present unfavorable to the inauguration of new enterprises involving the expenditure of large sums of money, I think it not improbable that a satisfactory arrangement with private parties may be made for the erection of a plant in City Creek Canyon, on such terms as will relieve the city from expending in annual payments for the same a much greater amount than it would otherwise annually pay under the present unsatisfactory system of lighting the city. A proposition of the character mentioned has already been made to the City Council, and is on file with the Recorder. The cost of lighting the city last year was $38,453.14, which is equivalent to 5 per cent. interest, the rate paid on bonds, on a capital of $769,062.80, or over 25 per cent. per annum on a capital of $150,000, which amount is amply sufficient to furnish an electric plant and other necessary appliances to light the city. Any satisfactory arrangement beneficial to the city, which you may be able to make in the premises, will meet my hearty concurrence."

THE Mayor of Kansas City, Mo., has signed what is known as the Tiernan ordinance, under which it is stipulated that it shall be unlawful for any company or companies to charge in excess of $1 per 1,000 cubic feet for gas supplied in that city on and after March 1st. Of course, the Kansas City Gas Light and Coke Company will resort to injunction proceedings, thus insuring a lengthy legal battle.

THE gas main under the Main street bridge, Nashua, N. H., which conveys gas to the southern section of the city, was fractured during the recent severe cold weather, but Supt. Norton and his men speedily repaired the break. It is estimated that the break caused a loss to the Company of 75,000 cubic feet of gas.

THE Boston Gas Light Company is before the Massachusetts Legislature, seeking sanction for consolidating with the Roxbury, South Boston, Dorchester and Bay State Gas Companies, the title of the consolidated enterprise to be that of the Boston Gas Light Company, with a capital stock equal to the total capital of the combining companies.

THE Buffalo *Express* says that Hornellsville, N. Y., will soon have a suit for damages on its hands. During the construction of the new sewer in Hornellsville the contractors were very neglectful of the gas and water pipes, wherefore the Hornellsville Gas Company, which lost many thousand cubic feet of gas and sustained many hundreds of dollars in damages to main and service pipes, proposes to hold the city responsible. The damages are placed at $5,000.

WE regret to record the death of Mr. John W. Proctor, President of the Danville (Ky.) Gas Company, whose demise occurred during the last week in January. Mr. Proctor was born in Kentucky (at a point somewhere in Garrard county), September 30th, 1828. His father was a farmer, and the son in early youth assisted him; but he eventually engaged in mercantile pursuits. In 1859 he engaged in the banking business, beginning in a small way in the service of the Deposit Bank, of Stanford, Ky. His capacity soon attracted attention in the banking circles of Kentucky, and in 1864 he became the active business man of the Central Bank of Kentucky, with headquarters in Danville. Since then he had been part and parcel of the best business and social affiliations of that section of his native State. His widow and two daughters survive.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has lately completed for the Aqueduct Commissioners of this city two iron bridges, one at reservoir "D," the other at reservoir "M."

Tests of Glow Lamps.

At an ordinary meeting of the British Physical Society a topic of discussion was based on a paper by Mr. Medley and Prof. Ayrton, who reported some further tests of glow lamps—the same authors having at a prior meeting handed in some notes on the subject. With the newer lamps employed in the latest tests the authors asserted they found that candle power, current, and candles per watt all rose as the lives of the lamps increased. The authors, being surprised at this result, took care to satisfy themselves that the effect observed was due neither to change in the resistance of their manganin potentiometer strip, nor to uncertainty of contact at the sockets of the lamps. Starting again with new lamps, they found that in all cases the light given out was greater after the lamps had been glowing for some time than it was when they were new. In the earlier tests a considerable falling off in candle power had always taken place after the lamps had been running for some time. Further, while the globes of the earlier lamps were always much blackened, even after a run of a few hundred hours, and so became comparatively useless long before the filament broke, the Edison-Swan lamps now examined showed hardly any blackening, even when the filaments lasted over 1,300 hours. The rise in candle power was always accompanied by a rise in current, which was, however, proportionally much smaller, so that the consumption of power per candle was actually less after the lamp had been running 50 hours than it was at the beginning. Among the conclusions drawn by the authors were the following: (*a*) When a group of Edison-Swan lamps marked 100-8 are run at 100 volts, and each lamp, as its filament breaks, is replaced by a new one, it may be expected that the light given out will never subsequently be as small as when all the lamps were new; (*b*) an Edison-Swan lamp marked 100 8, when run at 100 volts, will give an average illumination of about ten candles, and will absorb on an average power of about 4.3 watts per candle, so that such a lamp must be regarded as a 43-watt lamp, and not a 30-watt lamp, as is frequently stated; (*c*) the maximum rise of light recorded during the life of any lamp was 45 per cent.; (*d*) with lamps of the type examined there is no point at which it becomes economical to discard a lamp before its filament actually breaks; (*e*) no marked economy can be gained by overrunning such lamps (*i. e.*, by using pressures exceeding 100 volts).

Professor Ayrton mentioned that the improvement in glow lamps, after running for some time, had been attributed to an improvement in the vacuum. Experiments made on new and used lamps by means of an induction coil showed that the more a lamp was used the better the vacuum became; but he (Professor Ayrton), though at first inclined to adopt this explanation, had since found that though in all the lamps examined the progressive improvement in the vacuum was equally marked, the increase in candle power varied vetween very wide limits, being very considerable in some lamps, and hardly perceptible in others.

Professor Rücker asked if it made any difference to the life of a lamp whether it were kept running continuously until the fibre broke, or were run for periods of a few hours, alternating with intervals of rest. The latter case would more nearly correspond with the conditions obtaining in practice.

Professor Ayrton replied that the lamps were kept running during the night, and were disconnected during the day.

Production of Ozone.

According to foreign chemical journals, the most recent method of producing ozone is that of Lieut. Poulsen, a Danish officer, and is based upon the oxidation of phosphorus in a special apparatus. A wide-necked glass jar is closed with a finely perforated porcelain plate, and 2 inches below this there is a similar plate inside the jar. Through the center of each passes a rod, which is curved upward at the lower end and terminates in a small cup for holding a piece of phosphorus. The jar contains sufficient acidulated water to submerge the phosphorus when the apparatus is not in use, and, when ozone is required, a small quantity of potassium permanganate is added to this, and the phosphorus raised by means of the glass rod above the surface of the liquid. Phosphorus acid is formed by contact of the phosphorus with the air, and converted into phosphoric acid by the action of the permanganate, while ozone is produced simultaneously and escapes through the perforations in the porcelain plates.

THE AMERICAN GAS LIGHT JOURNAL

MONDAY, FEBRUARY 18, 1895.

The Market for Gas Securities.

Consolidated shows no change for the week in respect of actual quotations, although the outward signs point to an increase in values. To-day (Friday) the opening was 128½ bid, offered at 129. Mutual and Equitable are steady, at last week's figures, and East River common is 24 bid. The gas bills are still hung up, but a fortnight ought to bring something in the nature of positive indications as to what the outcome is to be. The Coffey dollar rate bill for Brooklyn will be pressed to a conclusion, and the Senator puts up a pretty stiff argument in favor of his measure by continually harping on the voluntary action of the Brooklyn Companies in cutting the rate to 90 cents last year. The New York Companies will certainly have cause to remember the warfare in Brooklyn if the rate in this city should be cut, and the gas interest of the country in general should bear in mind the names of those connected with the Brooklyn Company solely responsible for the childish rate crusade. Brooklyn securities are nominally unchanged as to quotations. The Chicago reorganization plan we understand will shortly go into effect, and it is now asserted that Colonel Oliver C. Payne will be "big man." Indianapolis gas is strong, at 135 bid. Bay State, despite the advent of ex-Mayor Matthews to the helm, is down to 18½ bid. Laclede common is a trifle weaker, at 24½ to 25½.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 Wall St., New York City.

February 18.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	128½	129
Central	500,000	50	150	—
" Scrip	220,000	—	106	—
Equitable	4,000,000	100	178	180
" Bonds	1,000,000	—	107	—
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	152	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	95	—
" Bonds	150,000	—	95	—
N. Y. & East River Gas				
Common	5,000,000	100	24	—
Preferred	2,000,000		—	46
Bonds	3,500,000	100	81½	83
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	39
Preferred	5,000,000	100	89	91
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	120	—
Citizens	1,200,000	20	65	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	175	—
" Bonds	300,000		103	—
Peoples	1,000,000	10	85	—
" Bonds (7's)	368,000	—	100	—
(6's)	94,000	—	98	100
Metropolitan	870,000	100	160	—
" Bonds (5's)	70,000	—	—	155
Nassau	1,000,000	25	200	—
" Otfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	190	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	18½	18¾
Income Bonds	2,000,000	1000	44	45
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	80	83
2d " " "	3,000,000	1000	59	—
Buffalo Mutual, N. Y.	750,000	100	120	—
" Bonds	200,000	1000	95	100
Chicago Gas Company.	25,000,000	100	73⅜	73½
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	93	93½
Consumers Gas Light Co., Jersey City	2,000,000	100	—	70
Bonds	600,000	1000	90	95
Cincinnati G. & C. Co.	7,000,000	100	—	203¾
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal			90	100
Capital, Sacramento, Cal			—	50
Consolidated, Balt	11,000,000	100	62¾	63
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co	4,000,000		18	—
Con. Bonds	4,312,000		55	—
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
Fort Wayne Gas Co			71½	72½
" Bonds			77	78

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I build these Generators with any required capacity, from 3,000 cubic feet per hour upward.

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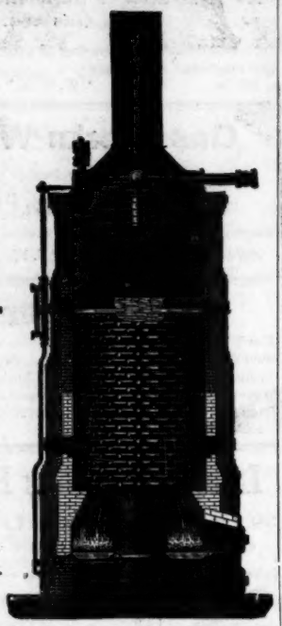

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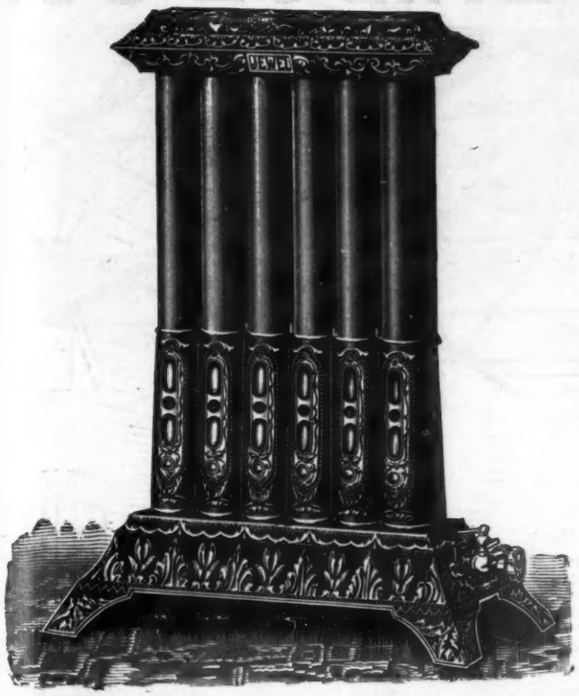

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If these Radiators were simply a duplication of what has been done, they would be worth but a passing notice.

One Continuous Tube
Instead of a Single Tube Construction.
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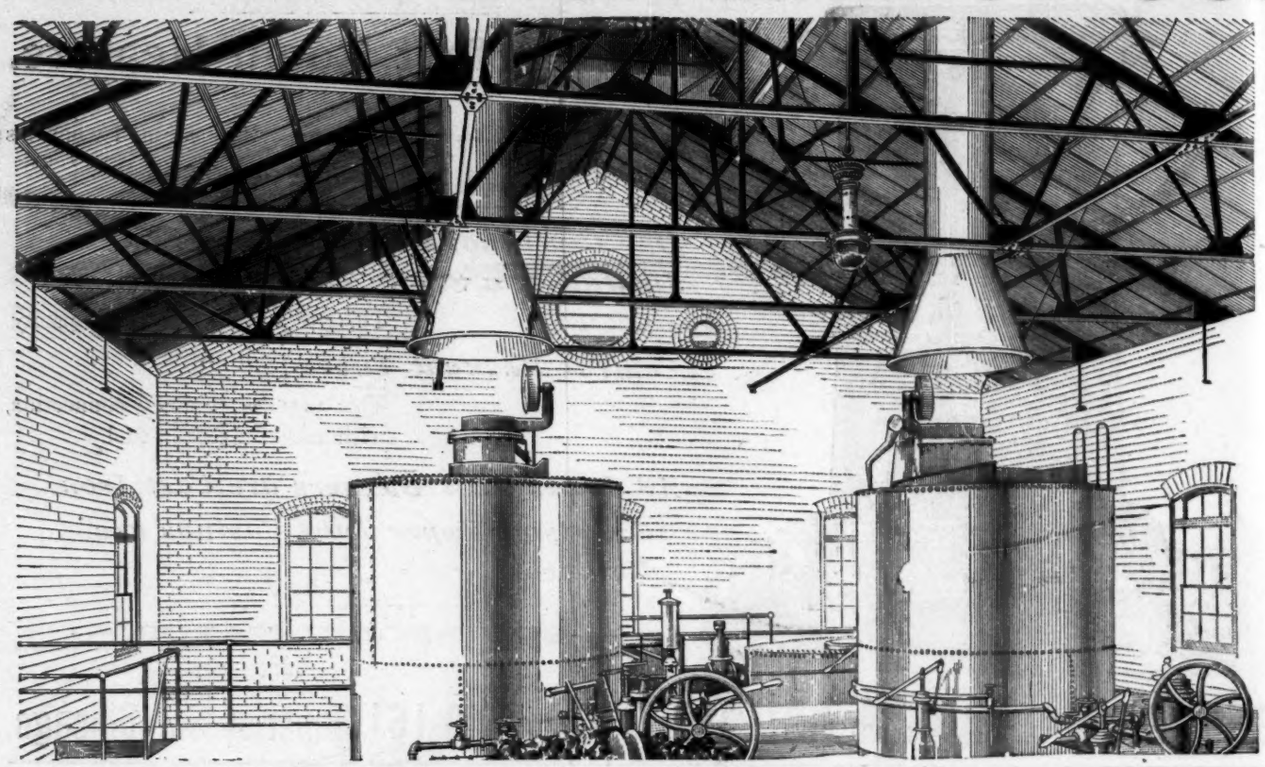

The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us for the Providence Gas Light Company, at Providence, R. I. The building is 40 ft. in width by 100 ft. in length, the side walls being of brick and the roof being entirely of iron—that is, iron trusses and iron purlins covered with corrugated iron. The building is ventilated by our Improved Ventilator, extending the full length of the roof, with side shutters opened and closed by cords from the floor. No woodwork is used in any way about the construction of the building.

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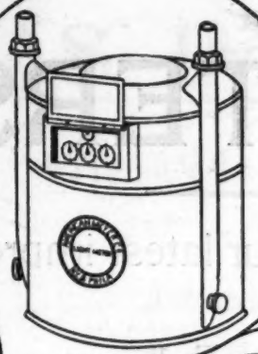
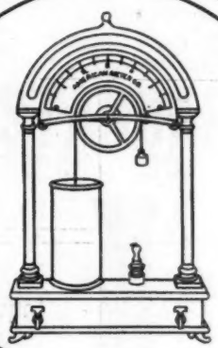
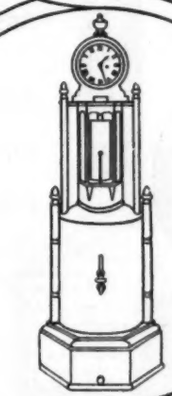
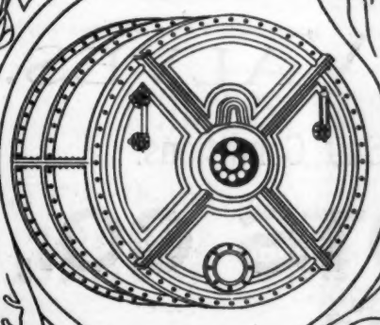








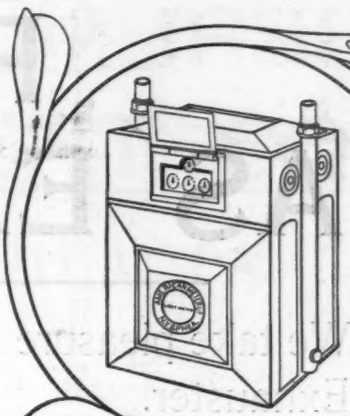
PUBLIC LIGHTING TABLE.

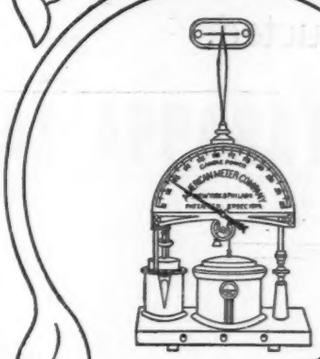
MARCH, 1895.

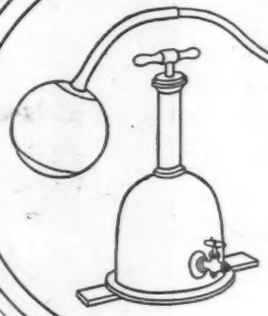
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	10.10 PM	5.40 AM	5.30	5.45
Sat.	2	11.20	5.40	5.30	5.45
Sun.	3	12.20 AM	5.30	5.30	5.45
Mon.	4	1.30 FQ	5.30	5.30	5.45
Tue.	5	2.30	5.30	5.40	5.35
Wed.	6	3.20	5.30	5.40	5.35
Thu.	7	4.00	5.30	5.40	5.35
Fri.	8	4.40	5.30	5.40	5.35
Sat.	9	No L.	No L.	5.40	5.35
Sun.	10	No L. FM	No L.	5.40	5.35
Mon.	11	No L.	No L.	5.40	5.35
Tue.	12	6.40 PM	9.10 PM	5.50	5.20
Wed.	13	6.40	10.30	5.50	5.20
Thu.	14	6.40	11.40	5.50	5.20
Fri.	15	6.40	12.50 AM	5.50	5.20
Sat.	16	6.40	2.00	5.50	5.20
Sun.	17	6.40 LQ	3.00	5.50	5.20
Mon.	18	6.40	3.50	5.50	5.20
Tue.	19	6.40	4.30	6.00	5.10
Wed.	20	6.40	5.00	6.00	5.10
Thu.	21	6.40	5.00	6.00	5.10
Fri.	22	6.40	5.00	6.00	5.10
Sat.	23	6.40	5.00	6.00	5.10
Sun.	24	6.50	4.50	6.00	5.10
Mon.	25	6.50 NM	4.50	6.00	5.10
Tue.	26	6.50	4.50	6.10	4.55
Wed	27	6.50	4.50	6.10	4.55
Thu.	28	6.50	4.50	6.10	4.55
Fri.	29	6.50	4.50	6.10	4.55
Sat.	30	10.20	4.50	6.10	4.55
Sun.	31	11.20	4.40	6.10	4.55

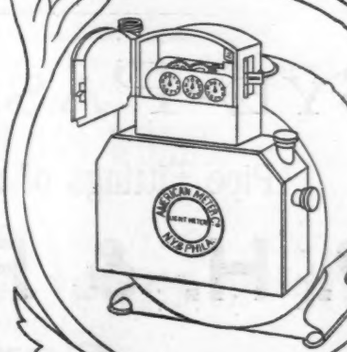
TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146.30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr	2161.20	Total, yr	3987.45









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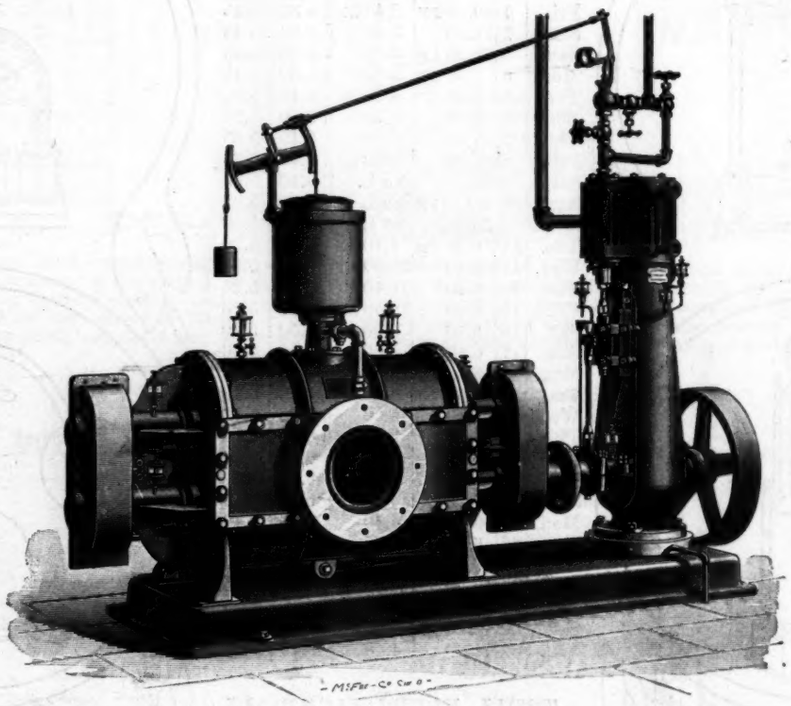

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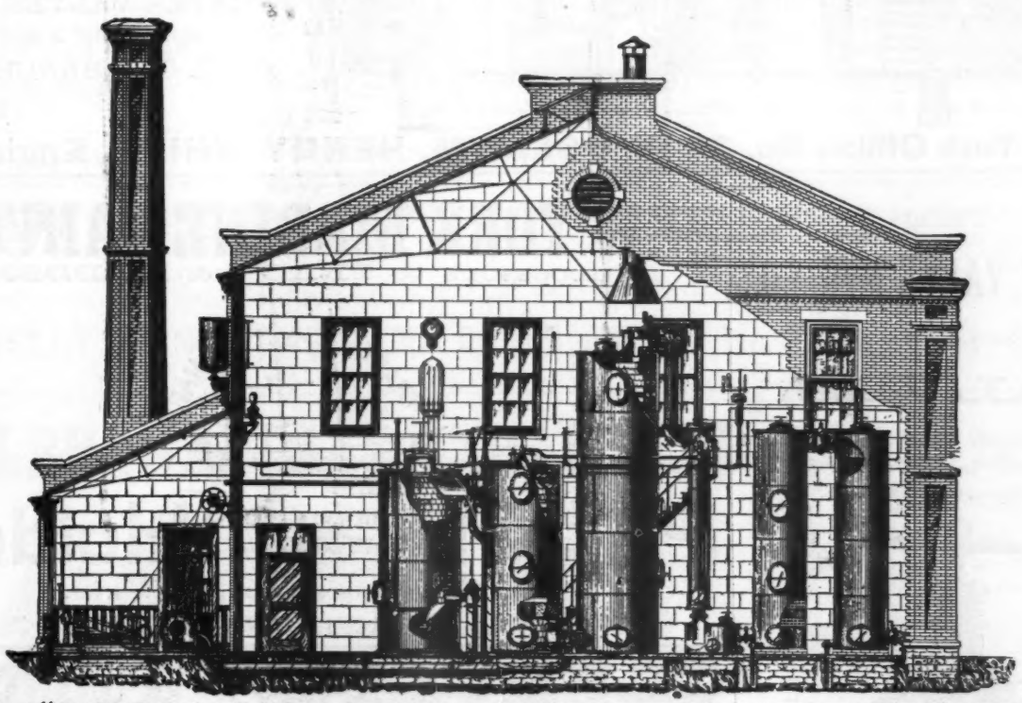

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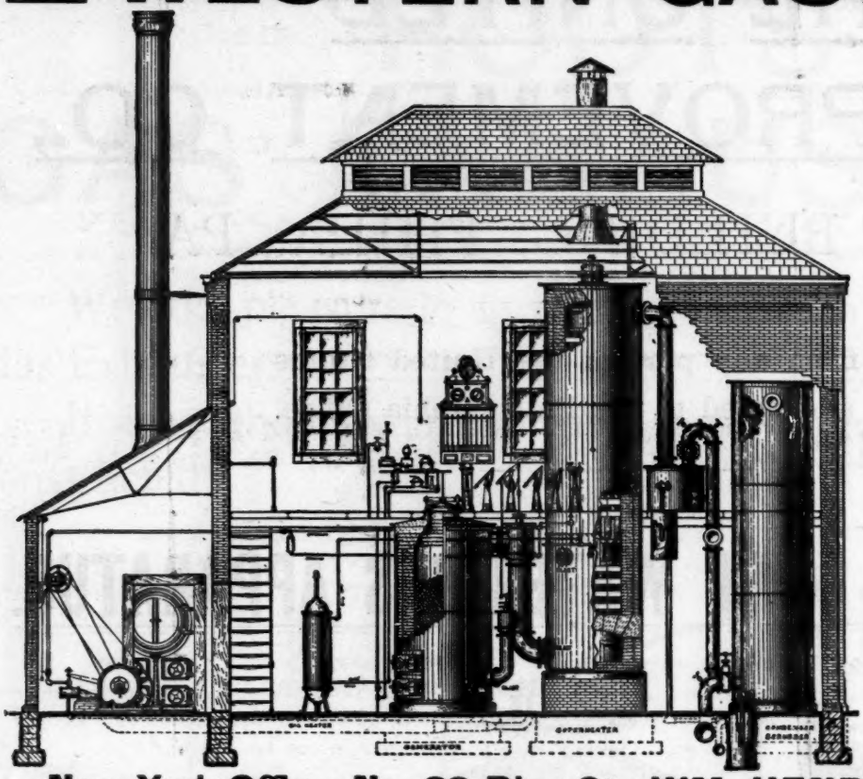

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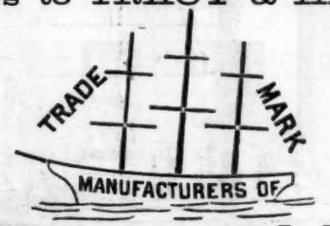

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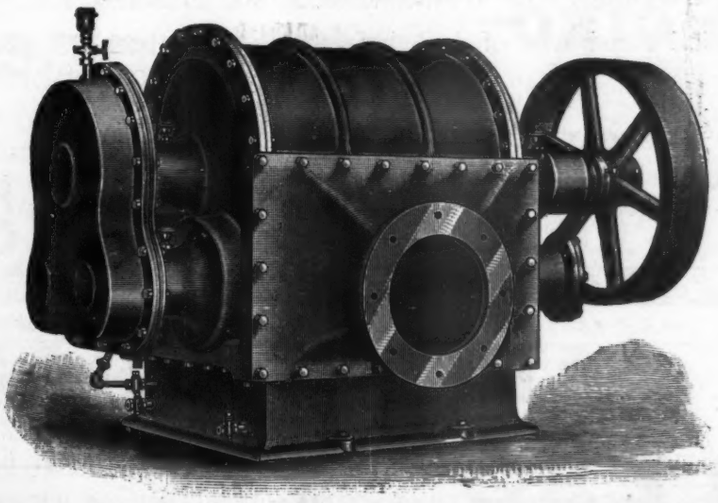

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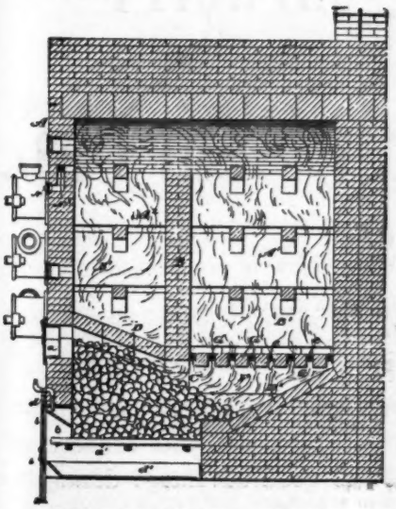

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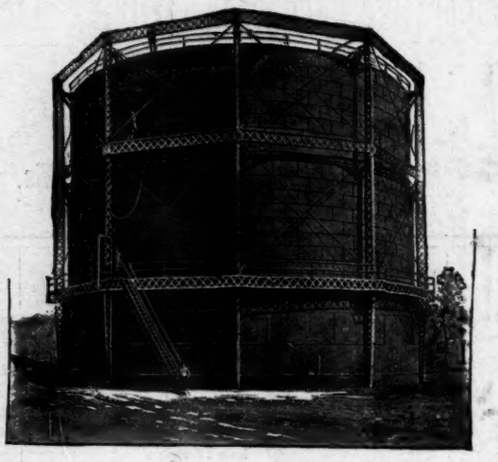

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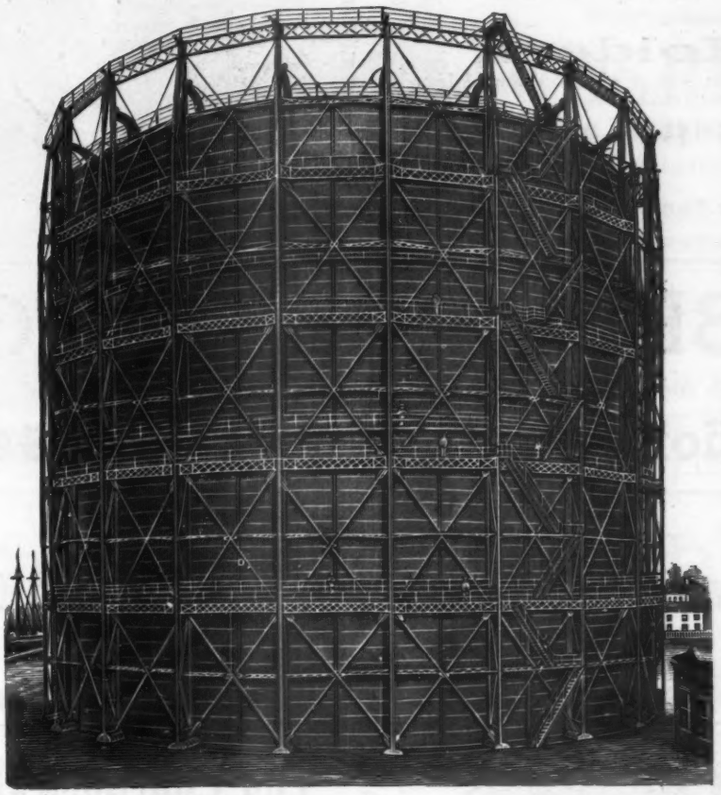

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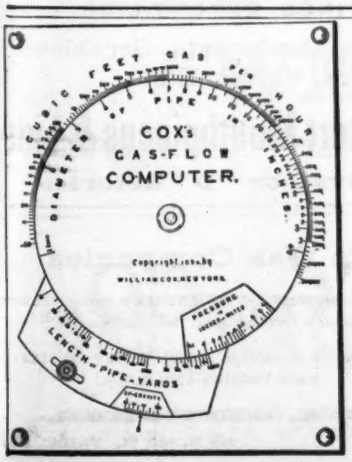

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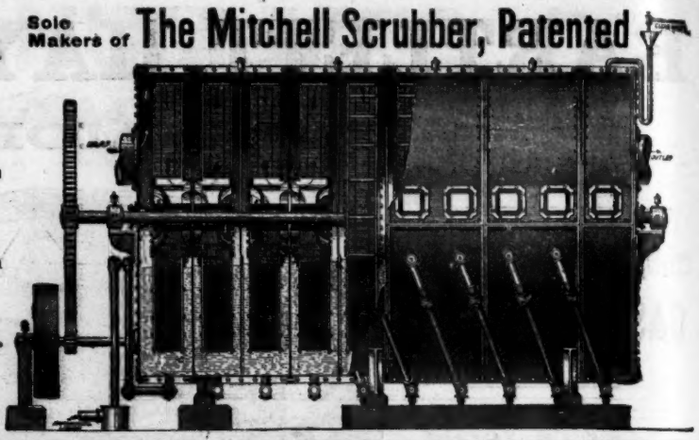

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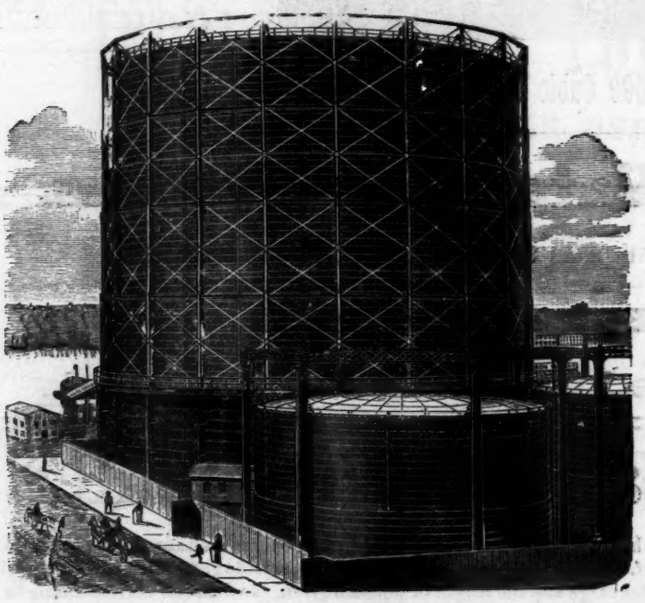

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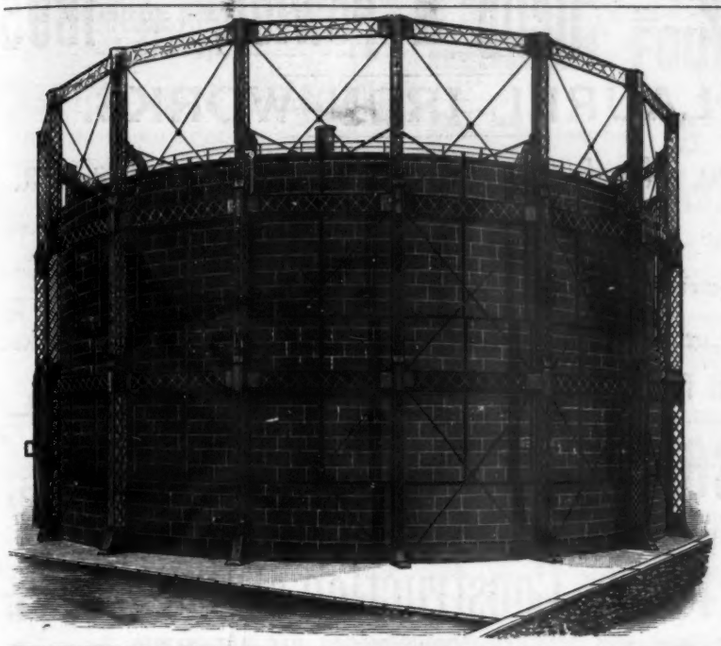

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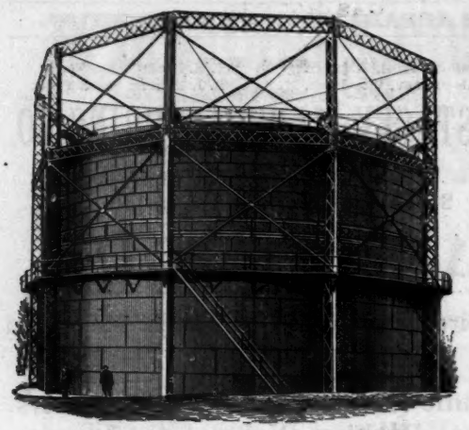

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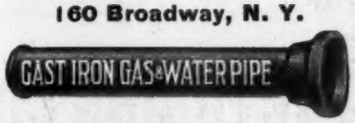

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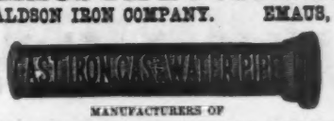

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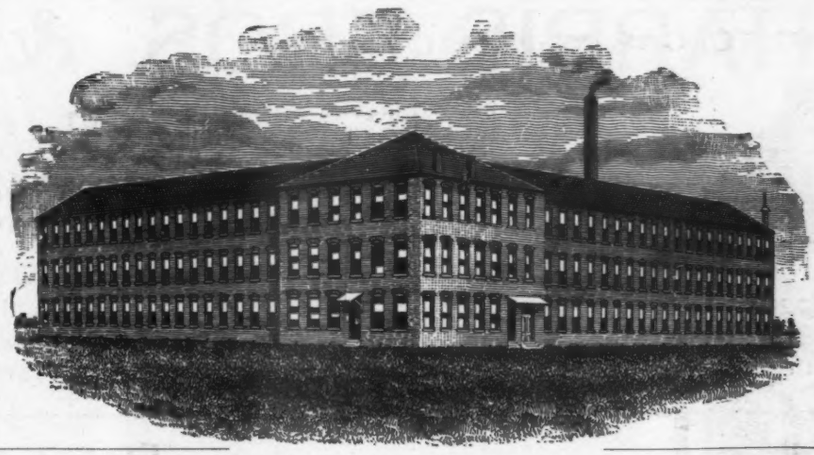

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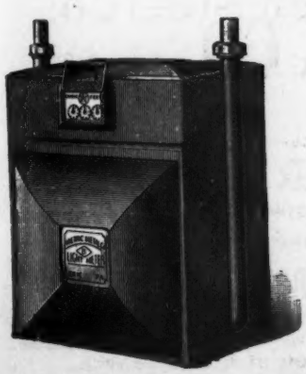

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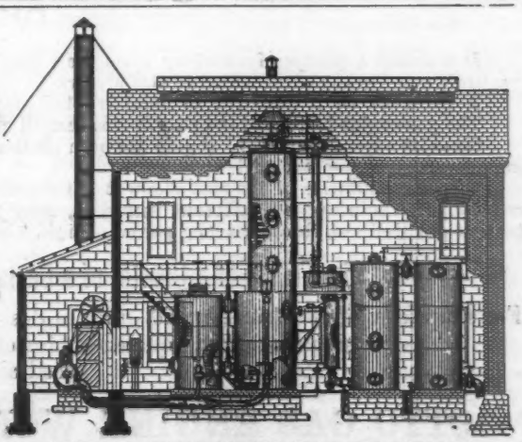

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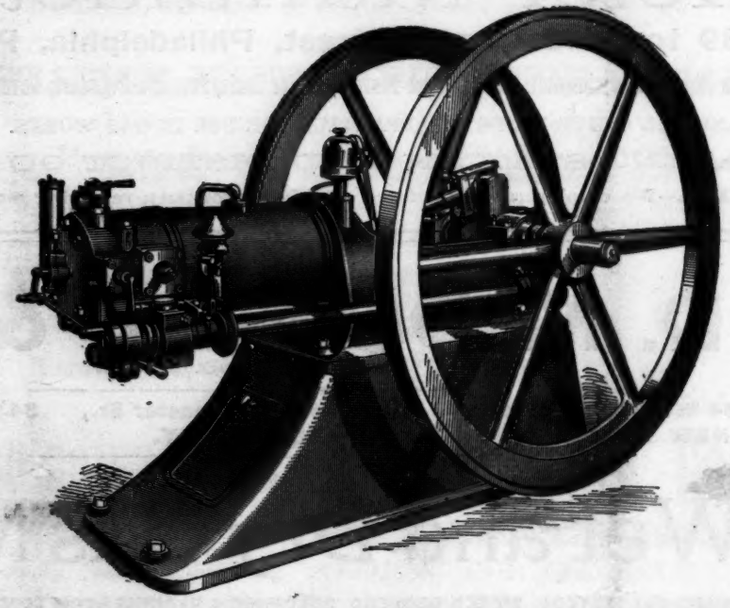

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